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AUTOMOTIVE INDUSTRIES

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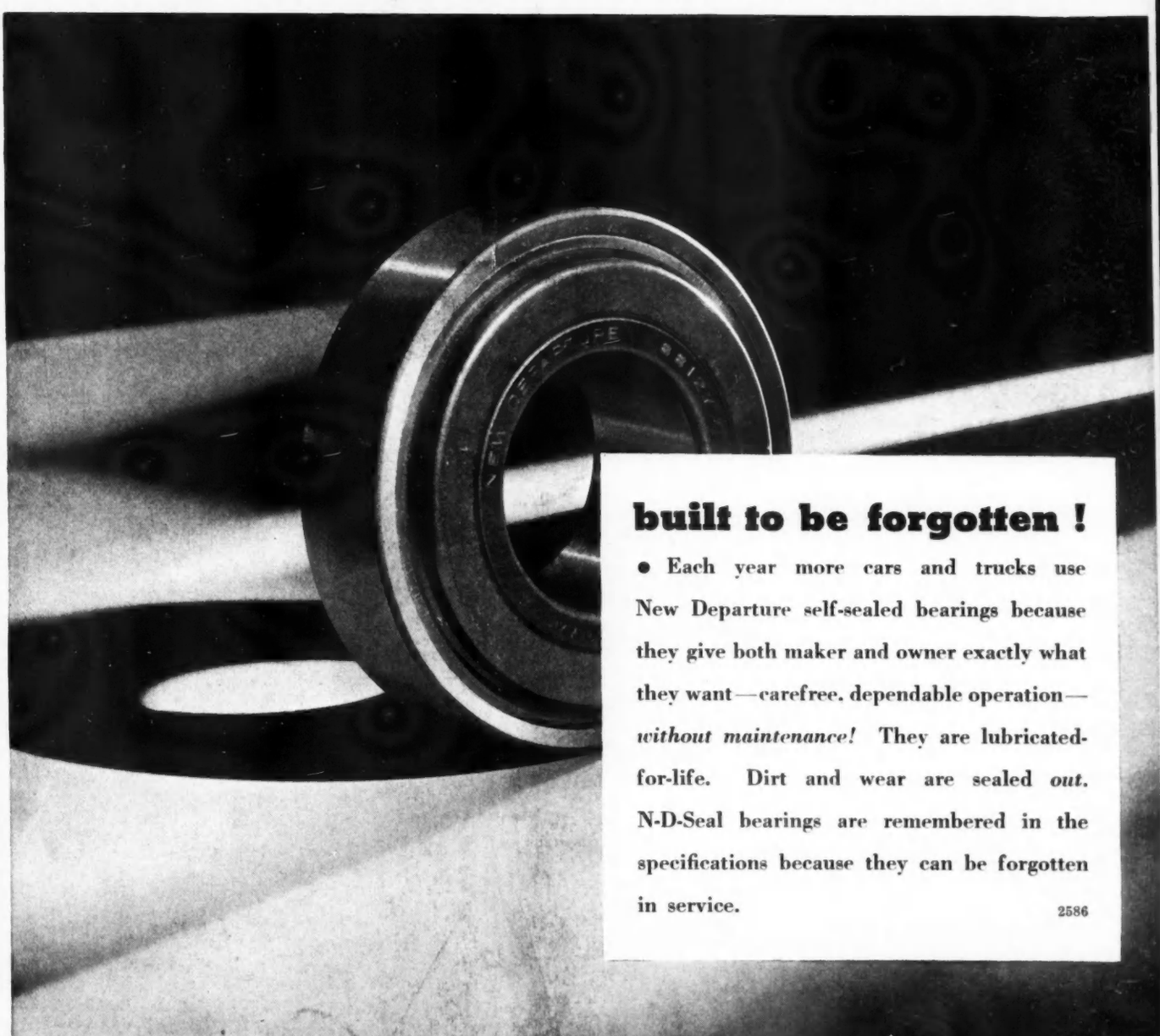

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2586

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A New CENTERLESS INTERNAL IN THE Heald FAMILY

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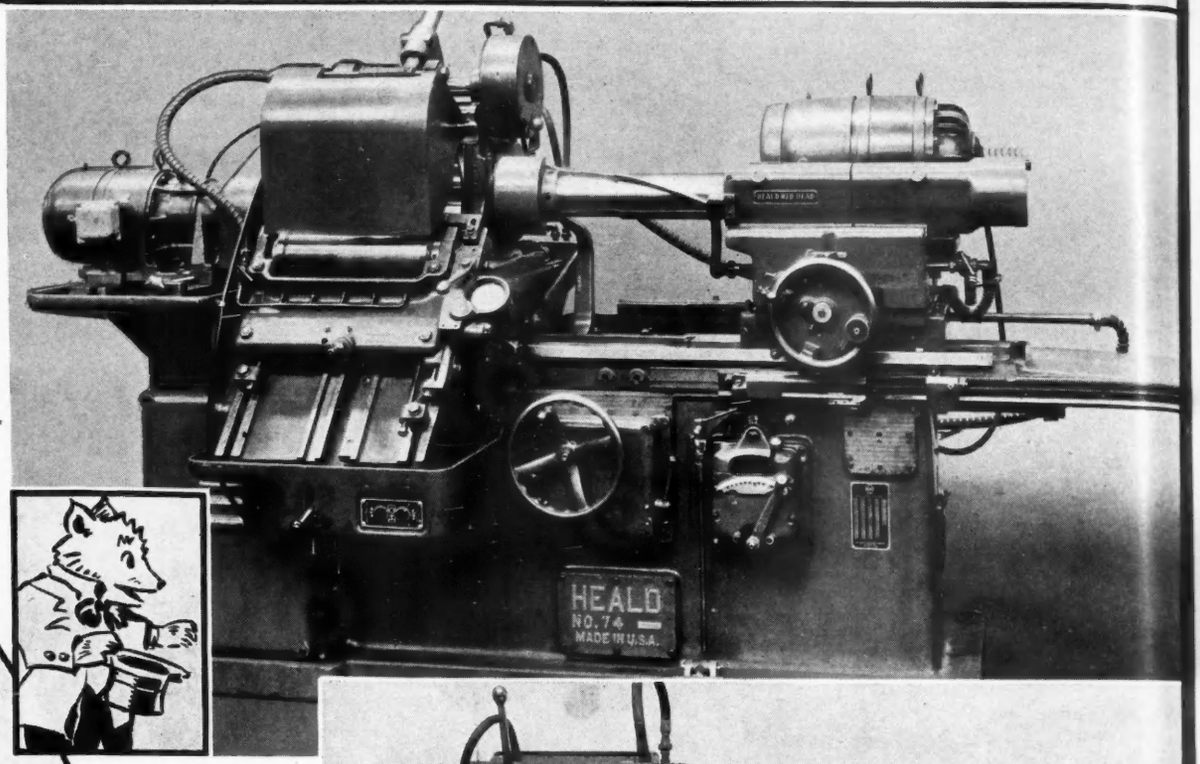
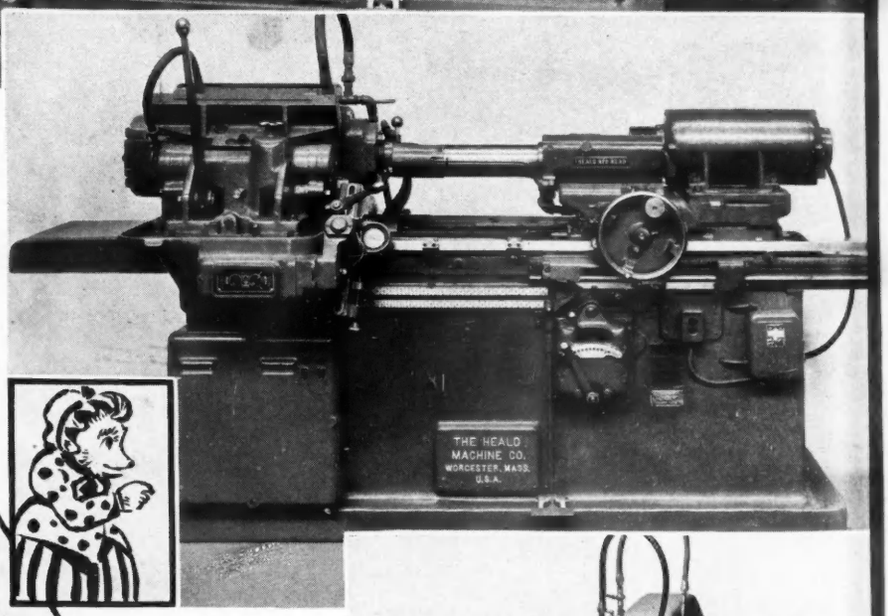


NO. 74 CENTERLESS

Grinds bores from 5" to 24" up to 16" long.

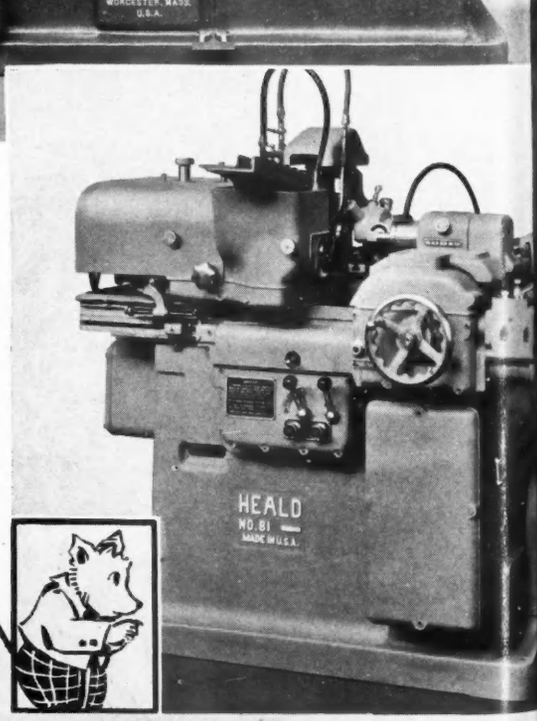
for Extra Large Work such as Large Cylinders, Big Bearing Races.



NO. 73 CENTERLESS

The No. 73 Centerless at the right is for large work such as Sleeves, Cylinders.

Grinds bores from 4" to 8" O.D. up to 16" long.



NO. 81 CENTERLESS

The No. 81 Centerless at the right is for small and average size work, such as Bearing Races, Bushings, Rolls, etc.

Grinds bores small as ¼" with O.D.'s up to 4½" diameter by 3" long.

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Old-fashioned "hit or miss" wiring is wasting power in nine out of ten factories, estimates reveal. Bring your plant's electric circuits up to date before a break-down occurs. A wiring survey will cost you nothing.

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How dollars fly out the window needlessly

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Safeguard your plant against these dangers

To aid you in discovering and preventing breakdowns... to enable you to stop hidden losses... we have prepared two useful books. One is our "Industrial Wiring Survey." This volume tells you how to find out what's wrong with electric wiring in your plant. The other volume is our "Industrial Guide for the Selection of Wire and Cable." Brand new, it is the only thing of its kind in the electrical industry. It tells you how to correct the troubles which a check-up of circuits reveals.

Write for the books shown at left. Then put the matter of a survey up to your electrical engineer, industrial consultant, or electrical contractor. If you have a specific problem, consult our Engineering Department. We will cooperate without obligation. 37541-A

A few of many Anaconda cables for industrial use

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Several well-known Anaconda rubber compounds are available for installation under ordinary moderate conditions of temperature, moisture, etc. Among these are Anaconda *Standard Rubber Insulated Building Wire,* Anaconda *Intermediate,* Anaconda *Duracode,* and Anaconda *"30 Per Cent".* These selections are for normal conditions. For special conditions, consult the "Guide" or ask our Engineering Department.

FOR POWER CIRCUITS

Anaconda offers *Rubber, Varnished Cambric,* and *Paper-insulated Cables* for a wide range of applications. Many have special features offering advantages not always found in such cables. Charts in the "Guide" indicate how to select the proper cable and there is always Anaconda's Engineering Department at your service for advice on unusual problems.

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Anaconda *Performite* is an example of a high-grade Anaconda compound for service such as fire alarm, signal and control cables. This cable has high insulation resistance, exceptionally good aging characteristics and physical properties.

For out-of-the-ordinary applications, we suggest that you consult the "Industrial Guide for the Selection of Wire and Cable." The services of our Engineering Department and Research Staff are available for assistance in the solution of technical wire problems or for the development of special cables.

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The AUTOMOBILE

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Published Weekly

Volume 77 Number 11

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AUTOMOTIVE INDUSTRIES

September 11, 1937
Vol. 77, No. 11

Big Fourth Quarter Forecast

Sales Boom in August and September Taken by Companies to Mean Large Volume in 1938 Despite Higher Car Prices

Automobile companies are making plans for a bigger final quarter than a year ago and for a 1938 volume at least equal to that of 1937. Neither the recent slump in the securities market nor the predictions being heard of a letdown in fall business have altered the views of the motor executives. To them, the business picture looks good and they see no reason to change their set-up for the coming model year.

Prophets of gloom find no support for their theories in the record of the automobile industry. Even at increased prices, the public is taking all the vehicles the factories have to offer and it looks like a perfect cleanup of old lines before new models are on the market. "The buying is great," said a sales official of one company which had experienced the biggest August volume in eight years and whose dealers will be in the best position in many years from the standpoint of new and used car stocks when the new models are announced. Several companies established new August delivery records despite increased prices and nearness to the end of the model year.

The industry as a whole last month is estimated to have sold at retail in the domestic market 345,000 cars and trucks, against 330,000 units in August last year. This represents a seasonal drop of 15.2 per cent from the July volume, compared with a decline of 17.5 per cent from July to August last year when the market had no hurdle to take in the form of higher prices. Model shortages are now being felt by dealers who are unable to replenish their stocks until shipments get under way on 1938 lines. But demand remains firm and early returns on September deliveries indicate that the current month will make a better showing in comparison with corresponding month last year than did August.

The first 1938 models began coming off the assembly lines at Packard and Hupp plants on Sept. 8.

Production last month went considerably higher than originally estimated as a number of plants which earlier had planned to operate on 1937 models into September maintained a high rate of output to the end of their model runs, finishing up before the end of August. The Automobile Manufacturers Association estimates August output at 410,200 cars and trucks which compares with 451,206 units in July and 275,934 in August last year. The increase over August, 1936, is 48 per cent. It brings output for the first

(Turn to page 343, please)

GM Sales Set Records

August Volume at New Peak; Seasonal Dip Small

Sales of General Motors cars in August set new records for that month in the company's history. In all three reported sales groupings, sales to domestic consumers, sales to domestic dealers, and world dealer sales, new high marks were established. Eight month sales were near records.

Volume was seasonally below that for July, but dropped less than last year. Domestic consumer sales fell 4.6 per cent from July against 18.1 per cent

(Turn to page 342, please)

UAW Hits "Wild Cats"

Plans to Drop Several Who Backed Such Strikes

Discharge of several UAW organizers and persons responsible for unauthorized strikes will be recommended to the international's executive board, meeting in Detroit, Sept. 13, according to Homer Martin, president of the United Automobile Workers Union. A majority of the executive board members elected at the recent Milwaukee convention are Martin adherents.

Notices were sent to all organizers and office employees of the UAW that their employment terminated Sept. 7 and that their re-employment would be passed upon by the executive board next week.

CIO and AFL unions in Detroit joined in a Labor Day celebration, staging a two-hour parade, the largest ever held in the city and the first since 1916. Among the marchers was a delegation of several hundred masked men and women representing the Ford UAW local who carried signs reading "When you recognize the Wagner Labor Relations Act, we will unmask. If we unmask now, we will be fired."

Conferences between General Motors officials and UAW representatives in connection with proposed changes in the union's contract with the corporation were resumed Sept. 8. Negotiations which began early in August were postponed during the UAW national convention. The conferees resumed discussion of W. S. Knudsen's demands for guarantees against unauthorized strikes and the procedure for disciplining outlaw strikers. Homer Martin, UAW president, and several members of the union's GM bargaining committee participated in the first day's conference. The corporation was represented by vice president C. E. Wilson, F. L. Tanner and H. W. Anderson of the Industrial Relations Department, and S. M. DuBrul, GM economist.

This Week

NEWS includes announcement of the new Hupp cars, details of an especially-developed United Parcel delivery truck, comments of truck manufacturers on the probability of higher prices, engineering details of the German Auto-Union racing car, production and sales reports.

FEATURED is a description of the production of the new Buick automatic transmission.

Racing Cars Being Built

While they lack verification, apparently reliable reports indicate that there will be a completely new and speedier line of American racing cars entered at the Indianapolis and Roosevelt raceways next year. Particulars as to changes in designs have not been disclosed but confidence has been expressed that the new cars will give the United States a higher rating than in the past in the international contests.

One report has it that there will be five new American cars. Whether this number is correct or not it is understood that there will at least be several new ones. Among them, it is said, is

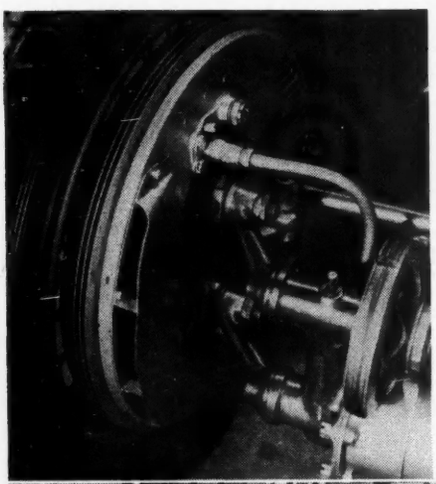
(Turn to page 342, please)

Stability Achieved in Racing Car

Porsche's Auto-Union Design Takes Account of Inertia Forces As Prime Factors in Road Holding on Turns

Photographic details of the rear-engined Auto-Union racing car which won the Vanderbilt Cup Race July 5 at Roosevelt Raceway, Westbury, Long Island, have been made available. They are the first official pictures of the car.

The machine was built by the Auto-Union corporation of Saxony from designs by Dr. Ferdinand Porsche, consulting engineer of Stuttgart. The car differs from the conventional racer chiefly in the arrangement of its major components. It was built for road racing, and as racing courses now usually are laid out with numerous rather sharp turns, the ability of a racing car to take turns at relatively high speeds and to slow down and accelerate rapidly is of great importance. The general layout of the components as embodied in the Auto-Union car is covered in a U. S. patent (2,091,652) issued to Dr. Porsche on August 31.



To succeed in a modern road race a vehicle must have superior road-holding qualities. In turning a corner, both the road-holding ability and the stability of the car depend to a large degree on the inertia forces. The centrifugal force causes a lateral inclination of the chassis, which results in transverse oscillations of the car. Accelerating and retarding forces cause longitudinal inclinations of the chassis, resulting in a rocking motion of the car. Finally, as a result of variations in the adhesion between the tires and the road owing to these inertia forces, a turning motion or slewing is likely to occur. The invention seeks to provide an arrangement which avoids all of these disadvantages.

In the Porsche racing car the sprung mass is so arranged that its center of gravity lies in the plane of the spring supports and the centers of gravity of the principal components lie close to the center of gravity of the chassis as a whole. With the center of gravity of the sprung mass placed in the plane of the spring supports, lateral inclinations of the chassis are entirely eliminated, as the centrifugal force on the mass then produces no turning moment around the spring supports. This arrangement, moreover, is claimed to also greatly reduce the longitudinal oscillations, for the accelerating and retarding forces which cause these oscillations also act at the center of gravity of the sprung mass, that is, in the plane of the spring supports, so that they do not produce any moments around the points of spring attachment.

By grouping the heaviest components close to the center of gravity of

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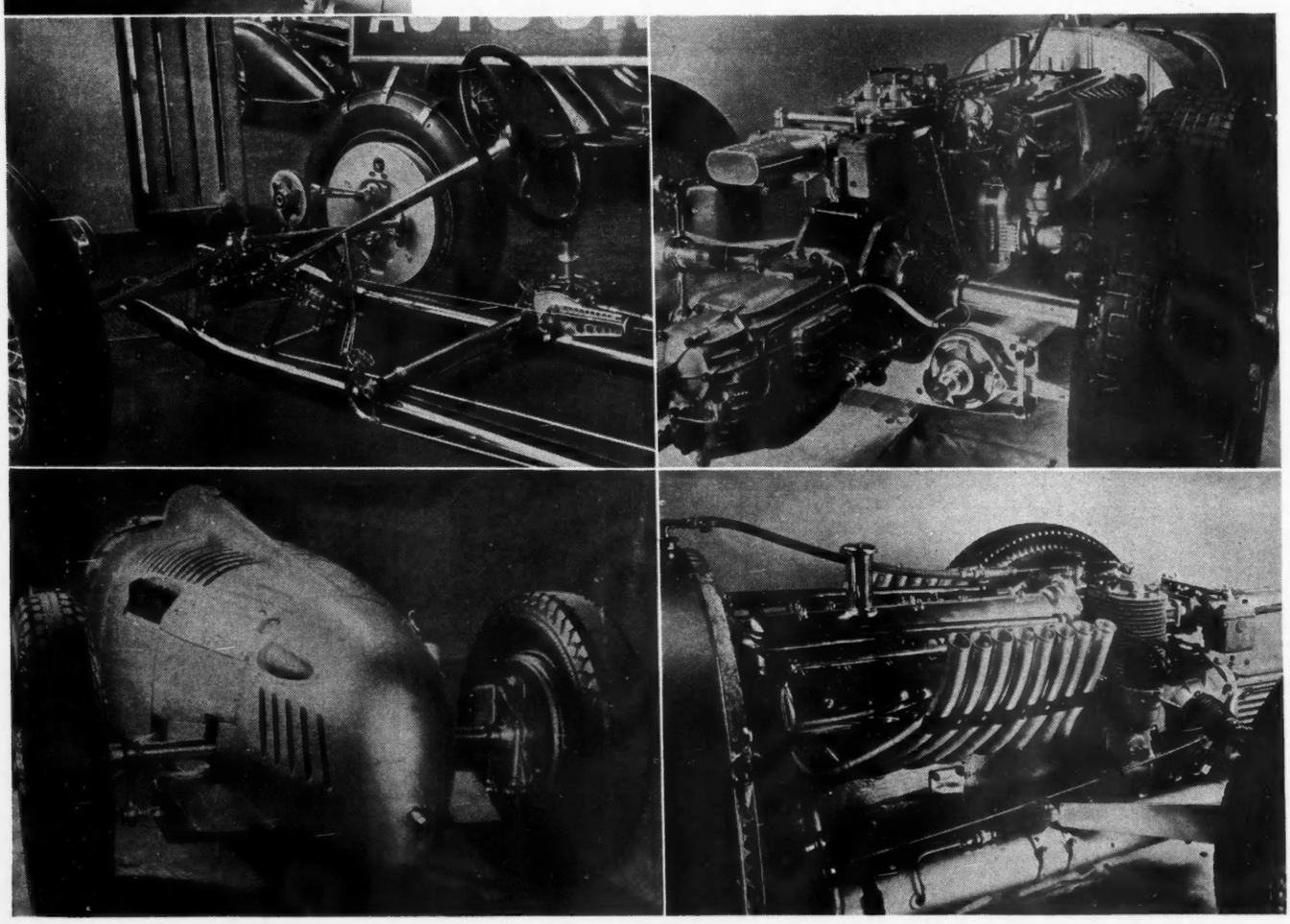

AUTO-UNION RACING CAR is shown in these pictures, first available in this country. In the upper left picture is shown a front wheel with the air-scoop for brake cooling, connections to the torsion bar front springing and shock absorber. Center left is the arrangement of the steering gear. Center right is a view of the rear-mounted engine, supercharger and transmission. At the lower left is the rear streamlining and details of a rear brake. The lower right picture shows the engine from the side looking toward the rear.

Japanese Car Shortage May Affect Quotas

With the Japanese demand for motor vehicles rising at a fast rate as the North China crisis aggravates, a "certain section" of Japanese official opinion is credited with the intention temporarily to lift the restrictions imposed on foreign manufacturers of automobiles in Japan by the Motorcar Industry Law of 1936.

The Japanese plants of General Motors and Ford reached the prescribed quota in June and July, respectively, and will be lying idle for the rest of the year, if the restrictions continue. They have been importing complete cars in considerable numbers to keep up with the fast rising demand.

Japanese manufacturers have speeded up production to a considerable extent, but they are unable to cope with the present demand situation.

Car Exhibits For N.Y. Show

Foreign cars again will appear at the National Automobile Show in Grand Central Palace, New York, Oct. 27 to Nov. 3. Two English makes and one Italian are on the list thus far, the English makes being the Acedes and the Lagonda, entered by English Motors, Ltd., and the Italian, a Fiat, to be exhibited by the Advance Corporation, Butler, Pa. This brings the total list of passenger car makes to be shown to 22. There are seven makes of commercial cars listed and 14 makes of cabin trailers, to date.

Additional space was allotted last week to several accessory and parts concerns, leaving but a small amount of space available on the third floor. Only a few more trailer exhibits can be accommodated in the trailer section on the fourth floor.

Passenger car exhibits include Acedes, Buick, Cadillac, Chevrolet, Chrysler, De Soto, Dodge, Graham, Hudson, Hupmobile, La Salle, Lagonda, Nash, Nash-Lafayette, Oldsmobile, Packard, Pierce-Arrow, Plymouth, Pontiac, Studebaker, Terraplane and Willys.

Commercial cars to be shown include Chevrolet, Dodge, Terraplane, Plymouth, Pontiac, Reo and Willys.

Trailer exhibits include Alma, Auto Cruiser, Bender, Covered Wagon, Curtiss Aerocar, Fleetwheels-Coates, Indian, Nash, Palace Travel Coach, Schult, Stream-Lite, Tralette, Travelodge and York.

Truck Prices to be Raised Again

Virtually All Costs Are Higher, Forcing Prices Up; Ten Per Cent Advances Soon Expected in Some Cases

Truck prices are going up again. Some of the increases will be as much as 10 per cent, following advances in early spring and summer of 5 per cent and more, leading manufacturers have stated to AUTOMOTIVE INDUSTRIES.

Succinct was the comment of one of the smaller-volume producers. His telegram said, "Owing to the price advances in aluminum, brass, copper, engines, transmissions, axles, steering gears, rubber, tires, labor and overhead, we are forced to advance our prices again as much as 10 per cent." This is particularly true of those companies which do not contract far ahead for materials in large quantities.

The larger-capacity trucks, and those with special bodies of almost any type are subject to the wider price increases. In addition, where any equipment other than standard is required, truck manufacturers have, or will doubtless, add substantially to the price of the truck. Increases on smaller trucks will probably run to between 3 and 5 per cent.

Following are some of the comments received on the truck price outlook:

We are contemplating price increases on some of our lower priced models. These are made necessary by rising costs—The Autocar Co.

Higher truck prices seem inevitable—Mack International.

At present we do not contemplate raising prices but are seriously considering increases in 90 days—Sterling Motor Truck.

Truck prices are generally out of line with costs and we believe early price increases are inevitable. However, we have nothing definite to advise with regard to our own prices—Federal Motor Truck.

We increased prices in June. Are unable to advise you on further increases at this time—Stewart Motor Corp.

We increased prices $15 to $200 on July 21—International Harvester Co.

Allot Truck Show Space

A. L. Rice, secretary of the National Motor Truck Show, Inc., announced that the following exhibitors have been allotted space for the fourth annual show, to be held at Newark, N. J., Nov. 6-12.

Fruehauf Trailer Co., White Motor Co., Brockway Motor Co., Inc., Chevrolet Motor division of General Motors Corp., Autocar Co., Federal Motor Truck Co., Studebaker Corp., Trucktor Corp., Reo Sales Corp., Mack International Motor Truck Corp., General Motors Truck & Coach Co., Ford Motor Co., Stewart Motor Car Co., Dodge Bros. Corp., Cummins Engine Co., Northern New Jersey Trailmobile Co., Inc., Wheels, Inc., Zenith Carburetor Co., DeLuxe Products Corp., Quaker City Iron Works, Bendix Products Corp., Hercules Motors Corp., Standard Oil Co. of N. J., Buda Co., Henry Lohse Auto Body Co. of N. J., Inc., Walter Motor Truck Co., Schwartz and Nag'e, Inc., Ward La France Truck Corp., Motor Improvements, Inc., W. C. Lipe, Inc., Thornton Tandem Co., International Harvester Co., Cleveland Pneumatic Tool Co., Timken Detroit Axle Co., Marmom-Herrington Co., Inc., Diamond T Motor Car Co., Four Wheel Drive Auto Co., Gar Wood Industries, Inc., Hegeman-MacCormack Corp., Packard Motor Car Co., N. Y., American Bantam Car Co., Continental Motors Corp., Truck Equipment Co., Inc., Bendix-Westinghouse Automotive Air Brake Co., Fitz Gibbon & Grisp, Inc., Clydesdale Motor Truck Co., Electric Battery Co., Detroit Compensating Axle Co., Briggs Clarifier Co., Waukesha Motor Co., Heil Co., and the State of New Jersey, Department of Motor Vehicles.

MEN OF THE INDUSTRY

WALTER and **CLARENCE FISHLEIGH**, Detroit consulting automotive engineers, together with American Bantam Car Co. designers, engineers and production men, have completed production plans for the new American Bantam line of trucks and autos.

FRED C. WILLIAMS, for the last three and a half years a member of the Detroit staff of Campbell-Ewald Co., advertising agency, has been appointed assistant advertising manager of the Nash Motors division of Nash-Kelvinator Corp. it was announced by A. R. Boscow, Nash's director of advertising and merchandising.

Creation of the post of director of used car sales and appointment of **JACK H. MORGAN**, for the last two years Nash district manager in the Boston area, to fill the new position were announced by C. H. Bliss, vice-president and director of sales.

GEORGE H. SEYBOLD, for many years in charge of crude rubber plantation operations in Sumatra and Malaya for the United States Rubber Co., has been elected vice-president and general manager of the Firestone Plantations Co., subsidiary of the Firestone Tire & Rubber Co., of Akron. He

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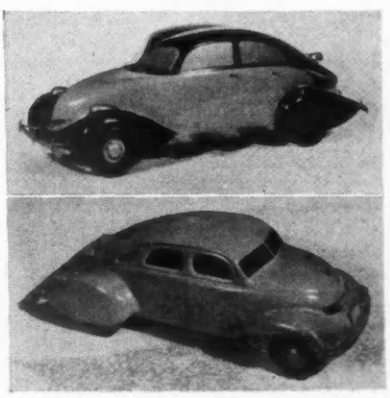

THE KIDS AGAIN —

Here are two prize winners in the Fisher Body Craftsmen's Guild model car competition. Above is a front-engine type made by a 14 year old Detroiter competing in the junior division. Below is a rear-engine type made by a lad from London, Ohio, competing in the senior division. This car is designed to have an air conditioning unit forward. Each boy won a $5000 scholarship.

FRONT AND SIDE views of the new United Parcel Service delivery truck. The condenser unit for the steam cooling system can be seen on the roof in the side view. Loading floor height is only 17 in. No body dies are necessary in the construction. Frame is of welded tubing. The truck was especially designed for ease in servicing. Engines are interchangeable.

United Parcel Develops Truck

Special Design for Local Stop-and-Go Delivery Model Has Steam Cooling; Is Easily Serviced; Frame Tubular

United Parcel Service, which operates in New York City, Cincinnati and on the Pacific coast as contract delivery for department stores, is completing 11 units of a truck designed and built within its own organization for urban delivery service. Under the direction of Ralph Werner, chief engineer, and based on United's experience as a fleet operator of more than 1500 vehicles in a highly specialized vocation, a design has been evolved which is claimed to be better fitted for short haul stop-and-go traffic than any vehicle commercially available. Analysis of the design will show, for example, that the engine is smaller, the clutch and brake area larger than in conventional vehicles of the same rating. Bodies have been designed for expediting package delivery.

The entire chassis frame, built of tubular steel side members and cross members, electrically welded, weighs 329 lb., is fitted with standard rear axle, transmission, clutch and the Linderman permanently equalized hydraulic brakes. The first five units are powered with Continental 4 cylinder engines of 162 cu. in., and the other units will have Continental 6 cylinder engines of 209 cu. in. interchangeable with the fours.

The over-all length of the truck is 16 ft. 5 in. (bumper to bumper) and the wheel base is 112 in. The front end weight is 2535 lb., and the rear end weighs 2150 lb. When fully loaded with the average run of department store merchandise the rear and front ends will weigh the same. Tires will be 6.50-20 all around, instead of 8.25 more generally used on vehicles of this capacity. It has 332.4 cu. in. net of loading space.

The whole unit has been designed to afford maximum ease of removing all component parts for quick servicing—an important factor in trucks for this type of service.

Ralph Werner, formerly associated with Ward-LaFrance and S. W. Rushmore, has designed the simplified steam-cooling system, one of the unusual features of the vehicle. A condenser unit is mounted on the roof of the truck, steam from the engine water jacket is carried to the condenser, a series of standard copper fin pipes, and the condensed water flows back to the engine.

The engine can be removed in about 10 min. A trained mechanic can do this in about 5 min., sharply reducing the time required for getting a truck back into service.

The bodies are built in three sections. The cab and rear end above the belt line, and the lower section are all constructed of ⅛ in. angle iron, onto which are bolted strips of hard wood to attach the paneling. This has eliminated the necessity for body dies. Fenders and side panels are flat, and the top is curved in front conforming with the shaped front end. A little hand hammering is required around the cab, which is over the engine.

The truck has a loading floor height of only 17 in. The floor is level except for two boxes over the rear axle kick-up. The steel flooring is welded to the frame.

A T-9 Warner transmission, Clark front and rear axle, and Delco ignition are used. Springs have been designed by the company without shackles, and are manufactured by the Detroit Spring Co. The front and rear springs are interchangeable, and are removed by removing one bolt.

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MEN OF THE INDUSTRY

(Continued from page 337)

will take charge of the Firestone rubber plantation operations in Liberia. Seybold returned to America from the Far East about 1930. He is a native of Mansfield, Ohio.

CARROLL J. ROGERS has been appointed general sales manager of the General Armature Corp., Chicago and Lock Haven, Pa.

FORMER COMMANDER J. H. KLEIN, JR., has been named director of inspection and standards of the Delco Brake division of General Motors Corp., it was announced by Frank H. Irelan, general manager. Commander Klein has been a member of the staff of Delco Brake division. He retired from the United States Navy war service several years ago to enter industrial work.

LEN W. REEVES has been made sales engineer of the original equipment division, Thompson Products, Inc. He has been southeastern district manager.

PAUL G. HOFFMAN, president of the Studebaker Corp., has been elected to the board of trustees of the University of Chicago.

F. S. YANTIS of F. S. Yantis & Co., Inc., underwriters, and **ARTHUR STONE DEWING,** public utilities executive and former Harvard professor, were elected to the board of directors of the Hupp Motor Car Corp. at the annual meeting of stockholders.

Uniform Trailer Use Rules

A committee to study the highway trailer problem and to propose uniform regulations for trailer use has been appointed by the eastern conference of the American Association of Motor Vehicle Administrators. It represents nine states including Pennsylvania, New York, New Jersey, Connecticut, Delaware, Massachusetts, Rhode Island, New Hampshire and Vermont.

The committee will report to a meeting of the eastern conference this fall at Providence, R. I., and will present recommendations to the National Safety Congress in Kansas City, Mo., Oct. 11, and to a fall meeting of the association of administrators.

Hupp Announces 1938 Series

Brings Out Custom 6, Custom 8, Completely Restyled; Plastics Much Used; Employs Special Body Insulation

Hupmobile, first to announce new cars for 1938, will offer three series, a six, a custom six and a custom eight. These will be the first cars produced by the reorganized company and the first produced since the old company ceased active operations at the end of 1935.

The new cars have been completely restyled and the bodies are made on new dies. Mechanically the cars continue the same basic features with detail modifications and improvements. The six wheelbase is 122 in., that of the eight 125 in.

Bodies are modern but conservatively so, all-steel, and wider and longer. Die castings and plastics are used to a considerable extent. Hoods are of alligator type, with automatic lift, and are hinged at the rear. Removable side stampings which carry the headlight shells and hood decorations, make for accessibility. The radiator grille is made in three sections with a die cast center portion. Hood ornament is die cast with a colored plastic insert also serving as a hood handle.

Windshield opening is 5½ in. wider than before and is one inch higher with the slope of the glass 30 deg. Windshield defrosters with double openings for the split windshield are provided. Safety glass all around is standard. The instrument panel is made of five molded plastic panels set in a steel frame which is finished in grained walnut. Electric clocks are standard equipment.

The cars carry Warner Gear synchro-silent constant mesh, short shift transmissions. An overdrive is standard on the eight. It cuts in at 40 m.p.h. Among the other features of the equipment are Auto-Lite fan-cooled generators with full voltage control, 15 plate, 105 amp.hr. Willard batteries on the six, 17 plate, 120 amp. hr. Willard batteries on the eight, fuel selectors, and a vacuum spark advance in conjunction with automatic governor advance on the eight. Starter is a pull-knob type used with a Bendix automatic shift on the starting motor. Ten in. single plate dry disk clutches are used. Needle bearing universal joints and tubular propeller shafts are fitted.

Headlights are of the depressed beam control type. There is a three-position switch and the usual toe button. Parking lights are built in. Tail lights are mounted high on the body at the end of the body decorating stripe. A single air horn is standard equipment.

Frames have been improved and strengthened. Radiator grille and headlight mounting is integral with the front fender bracing, making an insulated unit at the front end.

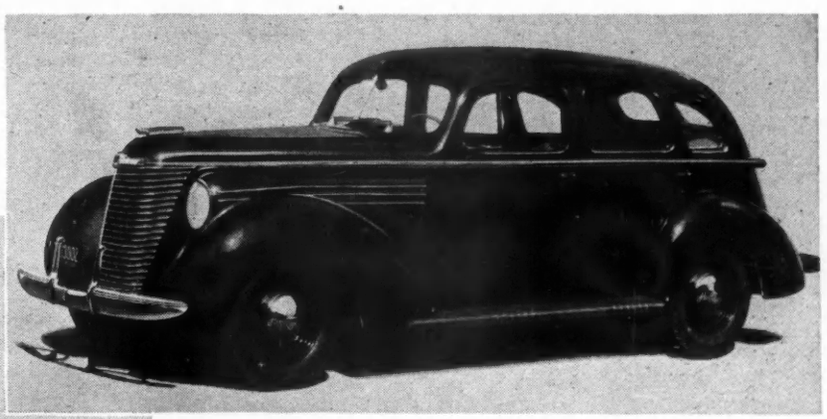
Careful insulation against temperature changes and noise has been provided. Sheets of special combination materials are used for this purpose.

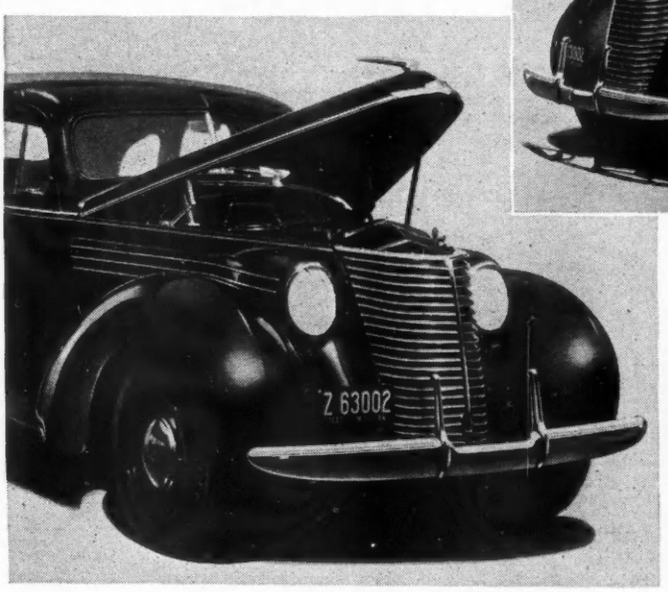
Front seats have multiple adjustments providing space for long-legged drivers and tilting backs for shorter persons. Doors are wide and luggage compartments are roomy.

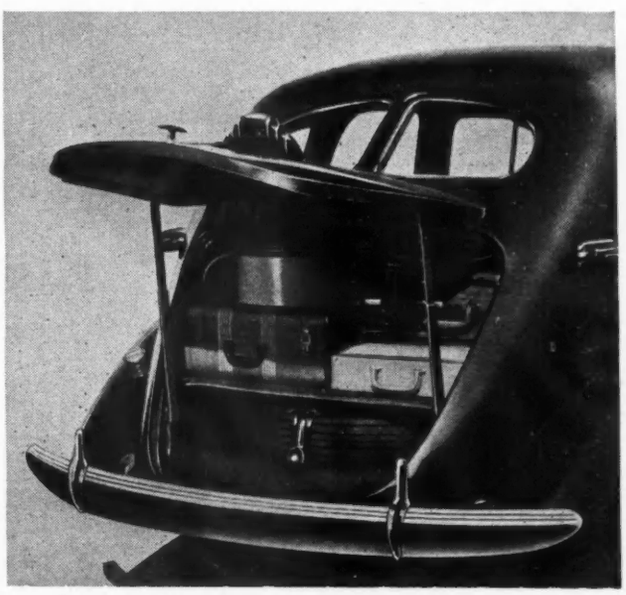
For engineering details, please turn to page 361.

Nash Plans Air Conditioning

Nash Motors division of Nash-Kelvinator Corp. is expected this fall to introduce air conditioned closed cars with dash control, it is indicated in responsible quarters. The development is being closely guarded and no details concerning its construction have become available. The device is expected to heat and condition the air in closed bodies. It is not yet certain that summer cooling will be possible. Sponsor of the idea is said to be G. W. Mason, president of the company.







WIDER, LONGER bodies, all steel, are features of the new Hupmobile line for 1938. At the left is a view of the alligator-type hood raised and front end treatment. Hood side plates come off to add to the accessibility of the engine. Above is a sedan, showing the trim. At the right is a view of the space afforded in the luggage compartment. It also shows the tail lights mounted high on the rear quarter.

Business in Brief

Written by the Guaranty Trust Co., New York

General business activity was well maintained last week, despite seasonal recessions in some branches and an impairment of confidence due to adverse developments abroad. The weekly index of the "Journal of Commerce" stood unchanged at 101.8, as against 93.5 a year ago. Dun & Bradstreet estimated retail sales at 1 to 4 per cent above those in the preceding week and 7 to 18 per cent above the volume a year earlier. Wholesale business was placed at 10 to 20 per cent above that in the corresponding period last year.

The movement of railway freight increased slightly during the week ended August 28. Loadings during that period totaled 787,373 cars, showing an increase of 6,126 cars, or 0.8 per cent, above the figure for the preceding week and a gain of 33,276 cars, or 4.4 per cent, above that for the similar period a year ago.

Power Output Gain Small

Production of electricity by the electric light and power industry for the week ended August 28 was slightly smaller than in the two weeks preceding but was 8.0 per cent above that a year earlier. This is the smallest gain above last year's corresponding figure reported in four weeks.

The Department of Agriculture estimates that farmers will receive approximately $9,000,000,000 from marketings of farm products and Government payments this year. This compares with $7,865,000,000 in 1936 and is the highest total for any year since the high of 1929.

Output of crude petroleum reached a new high record during the week ended August 28, averaging 3,731,450 barrels daily and exceeding by 2,100 barrels the average for the preceding week, which was also of record-breaking proportions. The current figure compares with 3,032,050 barrels a year ago and with a total of 3,462,900 barrels calculated by the Department of the Interior to be the aggregate of State restrictions.

Coal Production

Bituminous coal production during the week ended August 21 amounted to 7,550,000 tons, as against 7,640,000 tons in the preceding week and 7,671,000 tons in the corresponding period last year. Production for the calendar year to date amounts to 283,829,000 tons, as compared with 259,803,000 a year ago and 334,671,000 tons in the corresponding period in 1929.

Professor Fisher's index of wholesale commodity prices for the week ended September 4 stands at 91.0, as against 91.7 a week ago and 91.9 two weeks ago.

Bills discounted by the Federal Reserve banks increased $5,000,000 during the week ended September 1, following the reduction of discount rates by several of the banks. The gold stock increased $26,000,000, money in circulation $37,000,000, and member bank reserve balances $1,000,000. Excess reserves of member banks were estimated at $750,000,000, showing a decrease of $10,000,000 for the week.

F. K. Bauer

. . . appointed general sales manager, National Battery Co. He will be located at St. Paul, Minn.

Ontario Cuts Plate Prices

A straight reduction of $5 in all passenger automobile fees effective October 1, has been announced by Premier Mitchell Hepburn of Ontario. Present license fees for passenger cars are: four-cylinder, $7; six-cylinder up to and including 28 hp., $12; over 28, $15; eight-cylinder up to and including 35 hp., $15; over 35, $20; twelves, $30; sixteens, $40.

Company Earnings

White Motor

White Motor Co. reported net income for the six months ended June 30 of $653,197 or $1.04 per common share, against $287,421 or 46 cents a share, after all charges excepting Federal income taxes, for the first half of 1936. Gross sales were $16,910,552 against $13,775,741 for the 1936 period. Unit deliveries were 6737 against 5349. A new bus body building division will soon be in operation.

Lakey Foundry and Machine

Lakey Foundry and Machine Co. reported net income before taxes for the July quarter of $62,166 against net income of $1,250 for the like portion of last year. For nine months the net income before taxes was $124,767 against $18,250 last year.

Labor Turnover Up in July

Labor turnover was considerably greater in July than in June in the automobile and body and automobile parts manufacturing fields, according to the Department of Labor.

In the former, the total separation rate rose from 4.08 per 100 employes in June to 6.45 in July, against 8.36 in July, 1936. The separation rate was composed of a quit rate of 0.91 in July against 1.31 in June and 1.28 a year earlier, a discharge rate of 0.21 in July against 0.15 in June and 0.28 a year ago, and a lay off rate of 5.33 against 2.62 in June and 6.80 in July last year. The accession rate was 1.98 against 2.51 in June and 2.99 a year before.

In automobile parts, the total separation was 8.93 against 6.65 in June and 5.52 a year ago. Quit rate was 1.37 against 1.67 in June and 1.54 a year ago. Discharge rate was 0.29 against 0.29 in June and 0.40 a year before. Lay off rate was 7.27 against 4.69 in June and 3.48 a year ago. Accession rate was 3.35 against 3.95 in June and 4.50 in July, 1936.

Minneapolis-Moline Plan

A plan for recapitalization of the Minneapolis-Moline Power Implement Co. has been proposed to stockholders by W. C. MacFarlane, president. The basis of the plan is the exchange of the present preferred, which carries accumulated dividends, to equal $38.44 on Sept. 30, for a new lower-rate convertible preferred, giving present preferred stockholders a common for the bulk of the accumulations and a cash payment of $4 a share. The company needs cash for working capital and new facilities and has therefore elected to adjust the preferred dividend arrearage in stock instead of cash. For each share of present $6.50 preferred on which a $4 cash dividend would be paid, there would be given a share of $5.50 prior preferred and 2½ shares of common, payable one share this year and 1½ shares in 1938. Each new share of prior preference would be convertible for five years into five shares of common.

Financing Volume Off

Wholesale automobile financing held up better in July than did retail financing, reflecting the large production of new cars in that month and the seasonal slowing down of retail sales. Volume of wholesale financing for July was $172,145,221 against $180,318,827 in June and against $166,018,288 in July a year ago. Total retail financing in July was $174,155,660 against $193,728,106 in June and against $176,201,992 in June, 1936. New car retail financing was $106,665,064 against $118,322,650 in June and against $116,065,087 in June last year. Used car retail financing was $66,616,294 in July against $74,635,727 in June and against $59,226,773 last year in July.

. . . *slants*

BRIDGES FORGOTTEN—*Thousands of miles of new highway have become dangerous because of the failure of road-building authorities to keep bridges in repair. The idea seems to have been to build the roads first and then come back to repair and replace old bridges. Hundreds of feet of road can be built for the cost of even a short span. Rains and floods found the highway departments prepared so far as roads were concerned, but unprepared with respect to bridges, and wash-outs promptly occurred.*

QUEER ONE—*The automobile of Pete Hatcher, foundry employe, Clarksville, Tenn., was set on fire by a jug of water, and the blaze was extinguished by the same water. Hatcher said the jug was sitting a short distance from the upholstery. Sun rays were focused by the jug on the upholstery, which soon ignited.*

WOULD YOU JUMP?—*A Briton suggests that since so many people have gotten so used to automobile horns that they hardly are aware of a warning signal, a horn with the note of tires screeching on asphalt might bring results. He feels it would certainly cause those in the immediate vicinity to look around with some degree of apprehension.*

New Truck Registrations *

	July 1937	June 1937	July 1936	Seven Months 1937	Seven Months 1936	Per Cent Change, 7 Mos., 1937 over 1936	Per Cent of Total Seven Months 1937	Per Cent of Total Seven Months 1936
Ford	18,262	17,760	18,012	133,214	114,406	+ 16.8	33.19	29.96
Chevrolet	17,011	17,179	20,769	117,132	134,193	− 12.6	29.17	35.14
International	7,381	6,925	6,928	45,799	41,594	+ 10.0	11.41	10.89
Dodge	6,333	6,191	7,855	37,964	51,470	− 26.1	9.45	13.48
G. M. C.	4,088	4,146	3,363	27,657	14,696	+ 88.0	6.89	3.85
Plymouth	1,653	1,696	300	8,128	1,814	+347.5	2.02	.47
Diamond T	719	685	786	5,501	4,623	+ 19.0	1.37	1.21
White	530	521	513	3,809	3,144	+ 21.1	.95	.82
Mack	607	540	483	3,562	2,020	+ 76.2	.89	.53
Studebaker	587	651	350	3,552	1,853	+ 91.6	.88	.49
Terraplane	562	565	231	3,345	1,246	+169.0	.83	.33
Reo	445	454	366	2,883	2,289	+ 26.0	.72	.60
Federal	219	226	268	1,658	1,699	− 2.2	.41	.44
Autocar	281	199	137	1,327	683	+ 94.0	.33	.18
Brockway	152	139	207	1,015	1,000	+ 1.5	.25	.26
Indiana	91	157	216	901	981	− 8.1	.22	.25
Stewart	104	94	131	781	692	+ 13.0	.19	.18
Divco	60	113	52	729	624	+ 16.9	.18	.16
Willys-Overland	90	82	270	614	1,412	− 56.5	.15	.37
Stutz Pak-Age Car	90	81	.....	427	.....	.....	.11	.....
F. W. D.	24	32	21	282	215	+ 31.1	.07	.06
Sterling	34	33	22	220	116	+ 89.6	.05	.03
Kenworth	15	14	.....	87	.....	.....	.02	.....
Schacht	2	2	.....	36	.....	.....	.01	.....
Miscellaneous	111	143	155	908	1,142	− 20.5	.24	.30
Total	59,451	58,628	61,435	401,531	381,914	+ 5.1	100.00	100.00

*Does not include Wisconsin for July, 1937 and 1936. New law there prohibits release of monthly data.

Plant Notes

GM, Sealed Power Announce Building Programs

General Motors will manufacture carburetors at Kokomo, Ind., for some of its cars, it was announced by Ray C. Ellis, general manager of the radio division at Kokomo. A 32,000 square foot addition to the radio plant will be built immediately for production of the carburetors. Operations are scheduled for Jan. 1, 1938.

Plans for reopening the General Motors of Canada, Ltd., Regina, Sask, factory have been announced by H. J. Carmichael, general manager. The plant, idle since 1930, will resume operations November 15, employing approximately 400 men on a daily schedule of 125 cars and trucks. In the meantime $700,000 will be spent on a modernization program.

C. E. Johnson, president of the Sealed Power Corp., announced that supplementing the new construction just completed, an addition to the foundry and a new warehouse and new stockrooms will be built immediately to take care of the current expansion of business.

Three additions and alterations amounting to approximately $250,000 will be undertaken by Goodyear Tire and Rubber Company of Canada, Ltd., New Toronto, Ont., for the Bowmanville, Ont., factory.

40 Years Ago

with the ancestors of AUTOMOTIVE INDUSTRIES

Here's a Chance

The Fifth Avenue Coach Co., operating a line of stages on Fifth Avenue, New York, wish to adopt motor stages, and are in the market for a suitable system. Inventors and manufacturers who think they can supply what is wanted, should communicate with W. G. Peckham, 111 Broadway, New York. It is expressly requested that negotiations be opened by correspondence.

From *The Horseless Age*, Sept., 1897.

Many To Use Price Pacts

Initial response of manufacturers to inquiry by the Motor and Equipment Wholesalers Association whether they will avail themselves of the legal right afforded by Miller-Tydings Law and the related State Fair Trade Acts to enter into price agreements with resellers indicates that a large number will do so, according to the association.

The statement of the association reads in part as follows: "Immediately upon enactment of the Miller-Tydings Law, Motor and Equipment Wholesalers Association addressed manufacturers of record eliciting information as to whether they contemplate taking advantage of the national law and related state fair trade acts as a means of stabilizing profit margins of resellers on branded goods of their make.

"Although sufficient time has not yet elapsed to enable replies from all those written to, a very sizable percentage of responses have been received. A great majority of such responses indicate that manufacturers are giving the subject the deep consideration it deserves. It would appear that manufacturers of branded automotive products very generally will bring such products under price maintenance programs as legalized by this legislation.

"Manufacturers of equipment would, it would appear, be particularly interested in the new means under these laws of correcting conditions in the distribution of such products alleged by many to have reached a point said to be 'alarming'."

Road Research Station

Plans for the research station of the Bureau of Public Roads at Abingdon, Va., have recently been completed. Bids are being called for and will be opened on Oct. 18. Construction should begin soon thereafter. Completion of the buildings and the outdoor testing facilities for work such as has been carried on at the Arlington Experiment Station will give the bureau facilities it has desired for many years—adequately equipped and housed laboratories with considerable area for outdoor tests on a permanent location. Permanent development has not been practicable in the past at Arlington. The new site at Abingdon consists of 54 acres overlooking the Potomac.

Lower Priced Cars Gain in July

*U. S. New Car Registrations and Estimated Dollar Volume by Retail Price Classes**

	New Registrations				Estimated Dollar Volume			
	July		First Seven Months					
	Units †	Per Cent of Total	Units	Per Cent of Total	July †	Per Cent of Total	First Six Months	Per Cent of Total
Chevrolet, Ford and Plymouth	205,684	††57.54	1,373,543	58.37	$142,300,000	50.51	$950,300,000	51.14
Others under $750	5,993	1.68	34,816	1.48	3,400,000	1.21	19,850,000	1.07
$751-$1000	127,400	35.64	815,722	34.67	111,300,000	39.51	712,600,000	38.35
$1001-$1500	16,107	4.51	111,493	4.74	19,400,000	6.89	134,300,000	7.23
$1501-$2000	1,083	.30	8,235	.35	1,900,000	.67	14,200,000	.76
$2001-$3000	1,021	.28	7,535	.32	2,700,000	.96	19,900,000	1.07
$3000 and over	174	.05	1,743	.07	700,000	.25	7,150,000	.38
Total	357,462	100.00	2,353,087	100.00	$281,700,000	100.00	$1,858,300,000	100.00
Miscellaneous	69		909					
Total	357,531		2,352,996					

* All ca'culations are based on delivered price at factory of the five-passenger, four-door sedan, in conjunction with actual new car registrations of each model. The total dollar volumes are then consolidated by price classes.

† Does not include data for returns from state of Wisconsin.

†† This figure was 56.63 for June.

GM Sales Set Records

(Continued from page 335)

last year. World dealer sales dropped 17 per cent this year from July to August against 40 per cent last year. Sales to domestic dealers dropped 16.4 per cent this year against almost 43.8 per cent last year.

The business reflected the high production of 1937 model cars just prior to shutdowns for model changes. Output was large in order to make up for time lost during strikes earlier in the year. The consumer sales gain apparently reflected anticipation of price increases.

Above are details of the August sales reports:

	August 1937	July 1937	August 1936	10 Months of Model Year 1937	10 Months of Model Year 1936
Sales to domestic dealers	157,000	187,869	99,775	1,577,163	1,553,344
Sales to domestic consumers	156,322	163,818	133,804	1,520,390	1,520,771
Change in dealer stocks	+678	+24,051	−34,029	+56,773	+32,573
Sales to foreign dealers	31,010	38,812	22,168	365,732	311,912
Sales to world dealers	188,010	226,681	121,943	1,942,895	1,865,256

Automotive Metal Markets

More Than Usual Amount of Primary Steel Being Stocked; Industry Watches Automobile Situation Closely

Rate of ingot output, which for this five-day week is reported by the American Iron & Steel Institute at 71.6 per cent of capacity, is running relatively high, but it is sensed that more primary steel is being earmarked for stocking against future needs of finishing mills than usual. Finishing mills, catering chiefly to automotive consumers, resumed operations, following the double holiday shutdown, at much the same pace as prevailed late in August. Specifications call chiefly for material needed to supply dealers with 1938 model sample cars.

It is significant that in the steel market these days an outstanding topic of discussion is the probable reaction of the public to the price advances that were forced upon automobile manufacturers by higher material and labor costs, steel sellers obviously having come to the conclusion that more than ever their tonnage output will be determined by new car sales during the autumn and winter. Wire manufacturers, with a view to eliminating disturbed market conditions here and there, have announced a new differential set-up.

Due to the tight situation in the tungsten supply, advances in the price of high-speed tool or die steels have been announced, one manufacturer having raised the higher-priced grades from 67 to 80 cents a pound, effective Oct. 1. Bolt and nut manufacturers are getting some business from automobile manufacturers for special bolts, on which prices have recently been advanced.

The movement of pig iron to automotive foundries is rather slow.

The outlook in the non-ferrous steel markets was hazy at the resumption of business on Tuesday. Just when it looked as though London was taking a definitely more optimistic view regarding the supply of copper, with the result that the export price here had receded to a point where it was well below the parity of our domestic price level, a change in sentiment occurred in the British capital. On our holiday London chalked up moderately higher quotations for the red metal. On Tuesday the market was under the influence of Wall Street's pessimistic reaction to European developments, but marked time rather than reflecting sentiment in final quotations. The export price was slightly higher than at the close of last week, c.i.f. Liverpool being quoted at 13¾ @ 13.80 cents, as compared with 13⅝ cents at Friday's close. The domestic price for electrolytic was unchanged at 14 cents.

The same trend was in evidence in the tin market, where spot Straits on Tuesday was held at 58.60 cents, virtually unchanged from last week's close. Lead and zinc were also unchanged.

W. C. H.

Racing Cars Being Built

(Continued from page 335)

one being built by the Bowes racing team under the management of Louis Meyer, famous driver.

Under the international formula as now drafted all cars are placed on an equal basis, so that, for instance, American drivers may go to Europe to enter in race competition. The specifications for next year also remove disadvantages that heretofore prevailed which made it necessary to have different cars for the Indianapolis and Roosevelt raceways. Now that the same cars may participate in races on both speedways, manifestly this will reduce costs and it is expected to result in a greater number of entries.

July Exports Show Wide Gain

Total Dollar Volume Up 73.8 Per Cent Over Month Last Year Against 55.3 Per Cent in June

Exports for seven months were up 37.2 per cent over the like portion of the preceding year. July gains were very marked in the two lower priced passenger car classes and in all truck capacity classes. Truck and passenger car engines also showed wide gains.

	JULY 1937		JULY 1938		SEVEN MONTHS ENDED JULY 1937		SEVEN MONTHS ENDED JULY 1936	
	No.	Value	No.	Value	No.	Value	No.	Value
EXPORTS								
Automobiles, parts and accessories		$ 29,413,619		$ 16,915,076		$ 205,524,152		$ 149,738,787
PASSENGER CARS								
Passenger cars and chassis	19,115	10,531,006	12,531	6,576,588	142,466	83,578,253	112,997	63,801,548
Low price range $850 inclusive	17,694	8,966,827	11,855	5,832,137	130,098	69,834,242	103,899	53,582,413
Medium price range over $850 to $1,200	1,210	1,184,085	549	534,387	10,110	9,620,256	7,413	7,139,501
$1,200 to $2,000	151	224,372	94	137,369	1,654	2,544,026	1,144	1,689,817
Over $2,000	60	155,722	33	72,695	604	1,579,729	541	1,389,817
COMMERCIAL VEHICLES								
Motor trucks, buses and chassis (total)	15,114	9,505,175	9,725	4,947,973	91,383	52,573,193	67,435	34,034,552
Under one ton	2,436	1,045,066	1,693	661,258	11,668	4,613,143	10,696	4,050,544
One and up to 1½ tons	9,169	4,916,558	6,519	2,964,896	61,739	30,000,500	44,302	20,168,577
Over 1½ tons to 2½ tons	2,749	1,894,754	1,115	835,286	13,205	9,909,119	8,766	6,293,584
Over 2½ tons	715	1,580,681	195	350,858	3,923	7,378,028	1,885	2,697,019
Bus chassis	45	68,116	203	135,675	848	672,403	1,786	824,828
PARTS, ETC.								
Parts except engines and tires								
Automobile unit assemblies		4,035,496		2,035,861		34,644,359		27,472,386
Automobile parts for replacement (n.e.s.)		3,735,668		2,300,774		22,240,951		15,491,986
Other automobile accessories (n.e.s.)		369,228		196,867		2,542,542		1,846,990
Automobile service appliances		635,780		361,980		3,986,580		2,554,094
Airplanes, seaplanes and other aircraft	37	1,351,082	67	1,839,270	324	10,296,333	294	6,416,369
Parts of airplanes, except engines and tires		978,575		749,057		5,255,302		3,100,270
INTERNAL COMBUSTION ENGINES Stationary and Portable								
Diesel and semi-Diesel	78	278,208	55	126,620	485	1,178,612	255	749,967
Other stationary and portable								
Not over 10 hp.	2,519	98,838	964	58,380	12,813	673,883	6,788	415,798
Over 10 hp.	263	135,982	216	90,474	2,166	1,018,771	1,404	558,317
Automobile engines for:								
Motor trucks and buses	2,555	265,607	206	22,670	19,425	1,937,796	221	29,532
Passenger cars	4,780	342,532	18	3,740	58,639	3,977,351	2,450	145,244
Engines for aircraft	91	459,660	81	449,273	633	3,486,966	409	1,902,768
Accessories and parts (carburetors)		246,426		164,339		1,666,840		1,162,957
IMPORTS								
Automobiles and chassis (dutiable)	374	160,066	57	44,578	1,112	716,234	414	214,391

GM Dealer Council to Meet

Top executives of General Motors Corp. will speak to more than 7000 dealers and field executives on Sept. 15 in a telephone hookup of 51 cities in the United States and Canada, during the annual session of the GM Dealer Council in Chicago. Speakers will be Alfred P. Sloan, Jr., chairman; William S. Knudsen, president; and Richard H. Grant, vice-president in charge of sales of the corporation, and the following dealers: J. E. Brown, Don Lee, Inc., Los Angeles; H. V. Tuttle, Howard Automobile Co., Los Angeles; Harry L. Lewis, Milwaukee Avenue Motor Sales, Chicago; and H. A. Wehmeier, Community Motors, Inc., Chicago.

Big Fourth Quarter

(Continued from page 335)

eight months of this year to 3,784,400 units against 3,321,648 in the corresponding period last year, a gain of 14 per cent. H. E. G.

For the second time in three months, shipments of trucks overseas by Studebaker Export Corp. broke all previous monthly records in export history, it was announced by Arvid L. Frank, president.

Sales of Hudson and Hudson Terraplane cars for the month of August totalled 10,177 units, the best figure for that month since 1929. Sales for August, 1936 were 8372 cars. The gain for August of this year over last is 21.5 per cent, reported W. R. Tracy, vice-president in charge of sales of the Hudson Motor Car Company.

Chevrolet's new car and truck sales in the month of August reached 99,337 units, shattering previous records both for 1935 and for the boom year 1929, and setting a new all-time August high, W. E. Holler, general sales manager, announced. The month exceeded the total for August, 1929 by 4919 units, Mr. Holler said. Used car sales in the same period, he added, brought the combined total of 252,973 units for the month.

Of the total new unit sales Mr. Holler said, 22,120 were trucks. This is the second-highest August truck sales figure in the history of Chevrolet. Large volume in the truck and commercial car field is regarded as especially significant.

Oldsmobile's retail sales during August of this year established a new all-time high for the month, showing an increase of more than 38 per cent over the same period of 1936. Dealers delivered 16,978 cars as compared with 12,262 delivered during August, 1936. Retail sales for the last ten days of August totaled 5035 units, an increase of 827 cars over the 4208 Oldsmobiles sold at retail during the final ten day period of August, 1936. From Jan. 1 through Aug. 31 of this year, Olds retail sales totaled 146,700 new cars, a substantial increase over the first eight months of 1936.

Deliveries of Cadillacs and La Salles to customers during August ran 26.5 per cent ahead of the previous high for August, Sales Manager D. E. Ahrens announced. Figures show 3806 Cadillacs and LaSalles delivered this year against the former record of 3007 set in 1928 and 1740 in August, 1936. The month was off less than two per cent from July.

Delivery of 19,772 new Pontiac cars during August set a record, comparing with 12,274 for August, 1936. This was only a slight decrease from July. The figure set up for September by the sales manager is 15,500, which compares with 8811 for September one year ago.

TOOLS OF TOMORROW

Gear Finisher

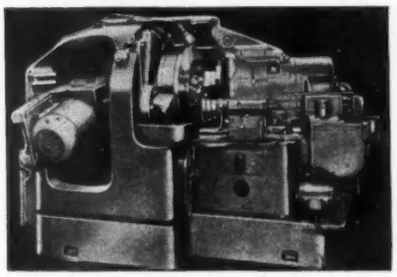
. . . *new single cycle spiral bevel and hypoid "formate" machine by Gleason*

Most recent offering of the Gleason Works, Rochester, N. Y., is a single cycle spiral bevel and hypoid "formate" gear finishing machine. The new unit, designated as model No. 22, will finish cut spiral bevel and hypoid gears as large as 18-in. pitch diameter, 2½-in. diametral pitch, 2½-in. face and 9-in. cone distance, having a ratio of 12 to 1. Largest pitch angle that the machine will cut is 85 deg. 14 min. while the smallest is 71 deg. 34 min. Index range is from 30 teeth to 78 teeth.

In operation, cutter and gear remain at normal full-depth position during the entire machine cycle. Provision is made for indexing by a gap in the cutter which follows after the second series of blades. When this gap moves into a position abreast of the blank, the latter is indexed.

Rigidity has been obtained by use of the overhead tie, heavy sections of castings generously ribbed and by hydraulic clamping of the work head. While the cut is taking place, the only movement is rotation of the cutter spindle which is mounted on preloaded anti-friction bearings. All other bearing and guide surfaces of the machine are securely fastened in place.

Chucking and dechucking operations are facilitated by a power chucking and stripping mechanism built into the work spindle and controlled by a conveniently located lever. The chucking arbor centers on the outside diameter of the work spindle for additional rigidity.



Single cycle spiral bevel and hypoid "formate" gear finishing machine made by Gleason

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Gear Burnisher

. . . *for improving and truing teeth surfaces announced by Cimatool*

A new Bolender burnishing machine for improving and truing surfaces of gear teeth has been announced by the Cimatool Co., Dayton, Ohio. Characteristics of the machine are reported by the manufacturer to be: ease and speed of both set-up and changeover; high production speed; better control of pressure between gears and a greater range of pressures available; increased accuracy in alignment between burnishers and work gears.

The advantages listed are said to have been accomplished by additions

(Turn to page 364, please)

Bolender gear burnishing machine made by the Cimatool Co.

AUTOMOTIVE ABSTRACTS

Salmson-Szydlowski Diesel-Type Aircraft Engine

This engine, which has been under development by Szydlowski for several years, is of the two-stroke, uniflow type, with cylinders arranged in V form. Two adjacent cylinders have a common combustion chamber. The transfer ports are located in one of these cylinders, the exhaust ports in the other.

One of the most serious difficulties experienced with this cylinder arrangement is that the pistons controlling the exhaust overheat. In addition to the pistons, the cylinder walls around the exhaust ports reach excessive temperatures, and this gives rise to lubrication troubles. In order to overcome this difficulty, in the Szydlowski engine the cylinder containing the exhaust ports is provided with the second set of ports connected up to the blower outlet. Fresh air enters through these ports and passes over the piston to the exhaust ports, whereby the temperature of the piston head is greatly reduced.

Very interesting means were employed in studying the scavenging process in this engine. Glass cylinders were used and were supplied with fumes of titanium tetrachloride, which made visible the path of flow of the gases and their distribution in the cylinders. Gas velocities were measured by means of miniature Pitot tubes.

The tests carried out with this equipment led to a very interesting observation, that while the inlet-port cylinder was perfectly scavenged, in the exhaust-port cylinder considerable burnt gas was retained along the wall adjacent to the inlet-port cylinder. By suitably locating the auxiliary inlet ports, an ascending current of fresh air was produced in the exhaust-port cylinder, which completely swept out the dead gases. A single-cylinder engine of 198 cu. in. displacement based on this principle developed 88 hp. at 1600 r.p.m., corresponding to a specific output of 0.444 hp. per cu. in. This engine, moreover, completed a 50-hr. endurance test developing 70 hp. at 1520 r.p.m.

In order to further improve the operating conditions from the standpoint of the temperature of the piston controlling the exhaust, and to increase the life of the engine, a special design was produced in which the bore of the exhaust cylinder is less than that of the inlet cylinder. In this way the operating temperatures of the two sets of cylinders and pistons were equalized. In addition, while the first designs had air cooling, the current designs are water-cooled, and the cylinder heads are cast with cooling ribs over which the water passes, so that they have substantially twice the effective cooling area of a plain cylinder. The water jackets, moreover, are of the "full-length" type, extending all the way down to the joint of the cylinders with the crankcase.

The latest improvements have to do with the design of the combustion chamber; they aim at reducing the resistance to flow of the scavenging air and thus reducing the pressure and power required for efficient scavenging.

On the basis of this principle, there was designed in 1934 a two-stroke, water-cooled engine with direct injection and fixed timing. It has nine cylinders and injection is accomplished by means of nine pumps, each of which supplies two injector valves located in the common head of the two conjugate cylinders. Scavenging is effected by means of a cylindrical blower with mechanical drive, which forces the air into a collector from which inlet pipes extend to the cylinders. The fuel employed is ordinary gas oil.

This engine has a bore of 118 mm., a stroke of 2 x 150 mm. (4.645 x 2 x 5.906 in.) and a compression ratio of 16 to 1. Therefore, the stroke/bore ratio is 1.27, the displacement of the individual cylinder 200 cu. in., and the total displacement, 1800 cu. in. At the normal speed of 1600 r.p.m. the engine develops 600 hp. and the b.m.e.p. is 81 lb. per sq. in. The specific output is 0.336 hp. per cu. in., which is quite good. The centrifugal blower used for scavenging has direct mechanical drive, the drive being effected through three pairs of multiplying gears. All three pairs have spur teeth and each pair is provided with a safety clutch limiting the torque which it will transmit. The normal speed of the blower is 13,500 r.p.m. and the multiplication ratio, 8.5. The inlet pressure is about 20 lb. per sq. in. and the power absorbed in driving the blower, 60 hp.

Lubrication is effected by means of three gear pumps which are independent of each other and are installed on the accessories housing. They serve for the lubrication of the engine, the blower, and the accessories, respectively. Engine starting is accomplished by means of a compressed-air engine.

The total weight of the engine in running order is 1248 lb., which gives a specific weight of a little over 2 lb. per hp. The specific fuel consumption, based on the maximum output, is 0.385 lb. per hp-hr. and the specific oil consumption, 0.013 lb. per hp-hr. The over-all dimensions are as follows: Diameter, 49.6 in.; length, 57.5 in.

This engine has been submitted for an official 50-hour test. — Auto-Moto-Avio, May 15.

Detonation Accompanied by Pressure Waves

A paper dealing with the influence on detonation of the physical conditions of engine operation and of the principal features of design, was presented to the French Society of Automobile Engineers by M. Max Serruys (an outside collaborator of the French Air Ministry) at a recent meeting. Experiments were made on a great variety of engines, air-cooled and water-cooled, L-head and I-head, poppet-valve and sleeve-valve. In taking cylinder diagrams, special efforts were made to determine the maximum pressures of detonating engines. Diagrams exhibited by the author show that the maximum pressure in the cylinder increased from 330 to 1325 lb. per sq. in., with a variation in power of less than 2 per cent, when changing over from normal to detonating operation. From an examination of the diagrams the author was led to the conclusion that the maximum pressure persisted only 0.0001 second. Another conclusion arrived at is that the maximum pressure registered (which, of course, is effective on the surface of the pressure diaphragm) does not exist throughout the combustion chamber. The diagrams show, moreover, that detonation occurs only toward the end of combustion, at which time the mean pressure throughout the combustion chamber already is quite near its maximum value. At that point pressure waves appear, the existence of which confirms the localization of the super pressure.

A study of the diagrams presented by the author showed that the period of pressure waves varies with the expansion; that the initial excess of pressure (over normal combustion) depends upon the point of the combustion chamber where the pressure element is located; that the number of pressure waves during a given period is the same at different points of the chamber; that the peak of the initial pressure wave does not arrive at the two points of the combustion chamber wall investigated at the same time but at an interval of 0.0001 sec., and that the velocity of the pressure waves as determined from the dimensions of the wave records, coincides with that which can be arrived at by calculation from the time interval of 0.0001 sec. mentioned above, or from the probable velocity of sound in the burnt gases, where the propagation takes place.

(Turn to page 368, please)

Goodyear Coast Election

The National Labor Relations Board has ordered an election held by eligible employees of the Goodyear Tire & Rubber Co., in Los Angeles, Calif., by Sept. 7 on the issue of whether the local union there of the United Rubber Workers Union of America, C. I. O. affiliate, shall be the sole bargaining agency for all employees. About 900 will be eligible to vote, it is understood. The election will follow a similar election at the parent Goodyear plant in Akron where employees chose the URWA by a vote of 8464 to 3193. Akron URWA officials are now negotiating with Goodyear on a collective bargaining contract. Similar negotiations are in progress with officials of the B. F. Goodrich Co., where employees voted 8289 to 834 in favor of the URWA. Goodrich has a Los Angeles plant and a similar NLRB election there is expected to be ordered shortly.

GM Adds Stockholders

The total number of General Motors common and preferred stockholders for the third quarter of 1937 was 363,675 compared with 359,630 for the second quarter of 1937 and with 342,832 for the third quarter of 1936. There were 343,125 holders of common stock and the balance of 20,550 represents holders of preferred stock. These figures compare with 339,130 common stockholders and 20,500 preferred for the second quarter of 1937.

A descriptive bulletin, No. 5592, has been issued by Fairbanks, Morse & Co. on its new **two-stage, built-together pump.***

Fairbanks, Morse & Co. has published a bulletin, No. 3600-A2, on its model 36-A **Diesel generating sets.***

National Broach & Machine Co. has published a series of descriptions of gear production machinery. Among them are folders on the Red Ring gear finishing machine, gear lapping machine, universal gear tester and gear speeder.*

Bulletin on the Hevi Duty **carburizing furnace** has been issued by the Hevi Duty Electric Co.*

The United States Department of Agriculture has issued a bibliography, No. 6016, on **agricultural engineering.***

* Obtainable from editorial department, AUTOMOTIVE INDUSTRIES. Address Chestnut and 56th Sts., Philadelphia.

Letters

to AUTOMOTIVE INDUSTRIES

Likes Drawings, Wants More Racing News

In regard to your engine drawings, which appear each week in AUTOMOTIVE INDUSTRIES, I say that these are the most interesting things in the magazine and should by all means be continued. I have followed the drawings of engines in the magazine for over 20 years and still review them constantly. I have all of my back copies and would not part with them.

The drawings show that there is still a great deal of individuality among the foreign builders. The American engines, on the other hand, a'most look as if they were designed by the same man!

The drawings of transmissions, hypoid axles, etc., are also very interesting and valuable.

I would suggest, additionally, that you give more space to such contests as the Indianapolis and Vanderbilt Cup races.

DONOVAN E. SHUMARD,
Milford, Ohio.

EDITOR'S NOTE: *Subscriber Shumard's letter is typical of scores received during the past month. Series II of the engine drawings will begin in the Oct. 23 issue and continue as long as material is available. Racing enthusiasts are referred to pages 336 and 369 in this issue, and are assured of our continued alertness to their requirements.*

AMA Opens Drive on Glare

To minimize headlight glare in the eyes of 40,000,000 drivers and all pedestrians, the Automobile Manufacturers Association announced that its member companies are undertaking a comprehensive program to encourage proper use and maintenance of headlamps. This new program will supplement the extensive activities in the general field of highway safety which the industry is supporting through the Automotive Safety Foundation.

In announcing the program, Alvan Macauley, president of the association and of the Packard Motor Car Company, revealed that the automobile companies are mobilizing the support and collaboration of the industry's thousands of dealers and service stations. In addition, the industry plans to make use of every available channel through which motorists can be impressed with the importance of proper use of modern headlighting systems to give relief from glare and of regular maintenance to provide safer seeing.

New Angle on Strikes

Something new in industrial relations came to light at Toledo on Sept. 1 when members of the Mechanics Educational Society at the Spicer Mfg. Corp. staged a sitdown strike over a seniority grievance despite the fact that the United Automobile Workers union is the sole collective bargaining agent and the MESA has no contract in the shop.

Company officials said about 15 were sitting down but MESA leaders said 200 were involved. Most of the MESA men are in the tool department.

Men claiming seniority rights to transfer to day shift have been retained on night shift and demands for extra night pay have been denied, the men claim.

AUTOMOTIVE INDUSTRIES

Looks Ahead

STAINLESS STEELS as used in automotive vehicles come in for their due share of attention as part of the materials' series which has been appearing in each third issue of the month. Next week H. E. Blank, Jr., assistant editor, will be the departmental conductor in charge.

MECHANIZATION of military units, to be completely appreciated, requires hindsight as well as foresight. A future issue will contain an article by Capt. Robert J. Icks. The title: "Four Decades of Military Mechanization."

Aircraft Engine Exports

The Department of Commerce reports that for the first six months of this year there were exported 543 aircraft engines valued at $3,027,322 against 328 engines valued at $1,453,495 for the like portion of last year.

Bantam Exports Arranged

American Steel Export Co., Inc., New York, signed a contract with the American Bantam Car Co., Butler, Pa., Sept. 3 to handle the export sales of the manufacturer. An order for 2500 cars was given for delivery as soon as possible, and a contingent order for a total of 40,000 for the next 12 months was included in the contract.

R. S. Evans, president of the Bantam company, said that production would be underway by the end of the month. The company has been manufacturing the automobile engines for industrial use. The powerplants develop about 20 hp., he said.

Calendar of Coming Events

DOMESTIC SHOWS

New York, National Automobile Show, Oct. 27-Nov. 3
Toledo, O., Automobile Show. Oct. 27-Nov. 3
Boston, Mass., Automobile Show, Oct. 30-Nov. 6
Los Angeles, Cal., Automobile Show, Oct. 30-Nov. 7
San Francisco, Automobile Show, Oct. 30-Nov. 6
Cincinnati Automobile Show. Oct. 31-Nov. 6
Akron Automobile Show .....Nov. 6-12
Brooklyn Automobile Show.....Nov. 6-13
Chicago Automobile Show .....Nov. 6-13
Columbus Automobile Show .....Nov. 6-12
Omaha Automobile Show.....Nov. 6-11
Detroit Automobile Show.....Nov. 6-13
Motor Truck Show, 4th Annual, Newark, N. J. .....Nov. 6-12
Newark, N. J., Truck Show.....Nov. 6-12
Buffalo, N. Y., Automobile Show..Nov. 6-13
Indianapolis, Automobile Show....Nov. 6-13
Newark N. J., Automobile Show..Nov. 6-13
Philadelphia Automobile Show....Nov. 6-13
Pittsburgh, Pa., Automobile Show.Nov. 6-13
Baltimore, Md., Automobile Show, Nov. 13-20
Cleveland, Ohio, Automobile Show, Nov. 13-20
Rochester, Automobile Show.....Nov. 13-20
Springfield, Mass., Automobile Show, Nov. 14-20
St. Louis, Mo., Automobile Show.Nov. 14-21
Portland, Ore., Automobile Show.Nov. 14-21
Denver, Colo., Automobile Show, Nov. 15-20
Jersey City, N. J., Automobile Show, Nov. 15-20
Milwaukee, Wis., Automobile Show, Nov. 17-24
Kansas City, Mo., Automobile Show, Nov. 27-Dec. 4
A.S.I. Show, Navy Pier, Chicago, Dec. 6-Dec. 11

SHOW BUSINESS

Manager of the National Automobile Show in New York is Alfred Reeves, 366 Madison Ave., N. Y. C. Inquiries concerning all matters connected with the national show should be addressed to him. AUTOMOTIVE INDUSTRIES will be pleased to furnish names and addresses of local show managers on request.

FOREIGN SHOWS

Poland, Automobile Salon (Foire Orientale), Lwow .....Sept. 1-15
Yugoslavia, Automobile Section, Autumn Fair, Ljubljana .....Sept. 1-12
Yugoslavia, Automobile Section, Commercial Fair, Belgrade.....Sept. 11-21
France, 31st International Automobile Salon, Paris .....Oct. 7-17
Great Britain, 31st International Automobile Exposition, London...Oct. 14-23
Czechoslovakian Automobile Show, Prague .....Oct. 16-24
Italy, 10th International Automobile Salon, Milan .....Oct. 28-Nov. 8
Great Britain, 13th International Commercial Automobile Exposition (trucks and buses), London...Nov. 4-13
Toronto, Ont., Automobile Show..Nov. 6-13
Great Britain, 36th Scottish International Automobile Exposition, Glasgow .....Nov. 12-20
Montreal, Que., Automobile Show, Nov. 20-27

CONTESTS

National Outboard Championship Regattas, Richmond, Va. .....Sept. 18-19

CONVENTIONS AND MEETINGS

International Congress on Carbohydrate Carburants, Rome .....Sept. 10-12
National Trailer Show, New York, Sept. 10-15
S.A.E. Section Regional Tractor Meeting, Akron, Ohio.....Sept. 15-17
American Transit Association, 56th Annual Convention, White Sulphur Springs, W. Va. .....Sept. 19-23
S.A.E. Section Regional Transportation Meeting, Chicago .....Sept. 29-Oct. 1
American Foundrymen's Association Midyear Meeting, Columbus, Ohio, Sept. 30-Oct. 1
S.A.E. Fuels and Lubricants Regional Meeting, Tulsa, Okla. ....Sept. 30-Oct. 1
National Lubricating Grease Institute, Annual, Chicago .....Oct. 4-5
S.A.E. National Aircraft Production Meeting, Los Angeles, Calif.....Oct. 7-9
American Foundrymen's Association, Regional Conference, Rollo, Mo. Oct. 8-9
National Battery Manufacturers Asso., Chicago .....Oct. 10-12
National Safety Congress & Exposition, Kansas City .....Oct. 11-15
National Metal Congress, Atlantic City, Oct. 18-22
S.A.E. Annual Dinner, Commodore Hotel, New York .....Oct. 28
American Petroleum Institute, 18th Annual Meeting, Stevens Hotel, Chicago .....Nov. 8-12
S.A.E. National Production Meeting, Flint, Mich. .....Dec. 8-10
American Road Builders' Association, Cleveland .....Jan. 17-21, 1938

Planned from "Carte Blanche"

the production line for the new Buick self-shifting transmission is unique in that most of the equipment is new and novel.

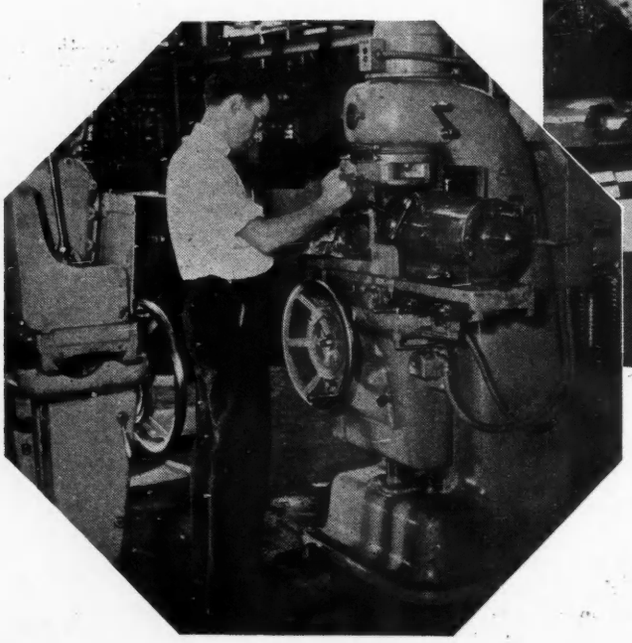
By Joseph Geschlin

A SELF shifting transmission will be optional equipment on the Series 40 models of 1938 Buicks. Behind this simple statement is a five-year sequence of development, beginning with purchase of the invention by General Motors, work on the invention at General Motors Research and a long period of experimental production paralleled by service testing on the road. Culmination of the program was a new transmission plant, devoted solely to the specialized product, representing millions of dollars of investment and many machine tools as new and smart as their paint.

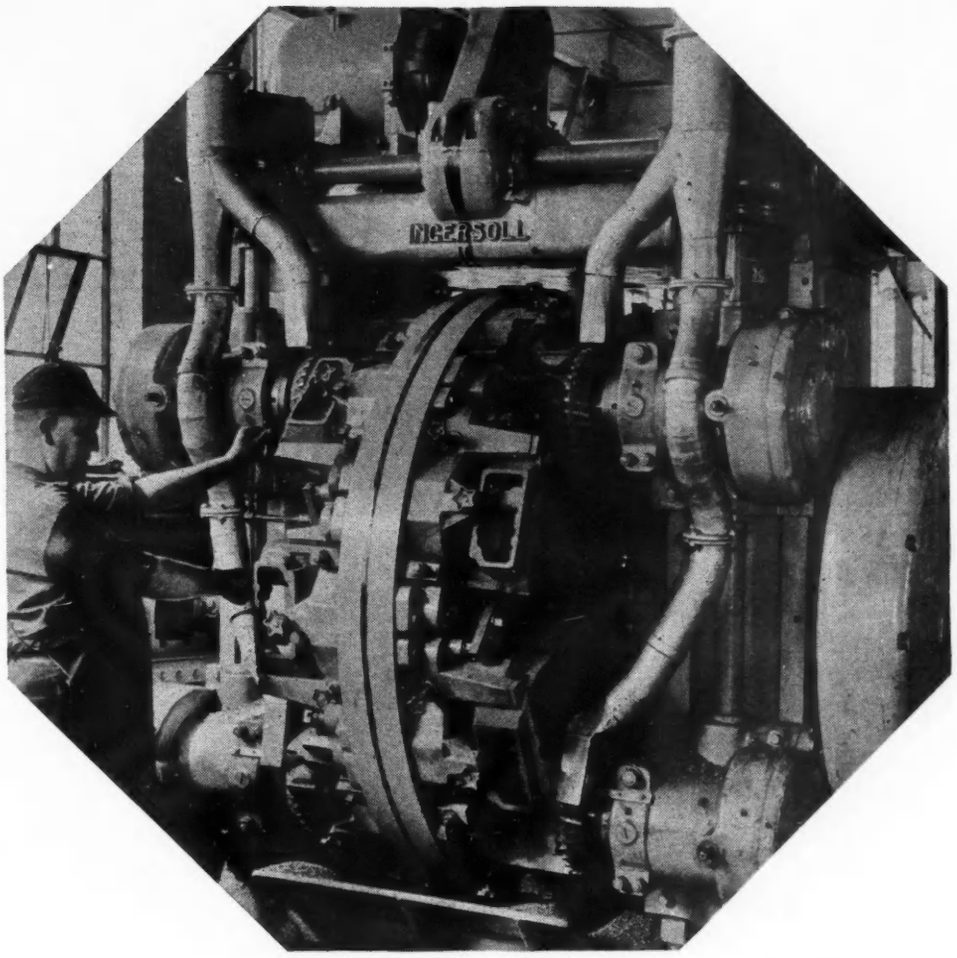
Because of its progressiveness in manufacturing techniques and because of unusual production facilities, the Buick division was asked to build this new transmission itself. They had to start from scratch with no previous experience on which to draw. True, this transmission has many elements similar to the conventional transmission—gears and shafts and case—but there the resemblance ceases for this automatic unit comprises a self-contained hydraulic system with a unique valving and pump. It contains a two-range centrifugal governor with linkage; it contains three planetary gear trains with servo-shifting mechanism for self-contained multiple disk clutches.

This job produced an event that comes about once in a production man's

A general picture of the new air-conditioned gear laboratory equipped with complete facilities and instruments for gear testing



Red Ring (National Broach & Machine) gear shaver is used for finishing internal gears prior to heat treatment



One of the huge drum type Ingersoll milling machines set up for rough and finish-milling top and bottom faces of case

lifetime. It's the unique case where the department could start from scratch with nothing but the walls and floor and ceiling of a new building, with sealed orders stating that they were free to develop the procedures and buy the special equipment that would put the job on a real production basis.

The tangible result is a new transmission plant—Plant 66—on the Buick property in Flint which has entailed an expenditure, at this writing, in excess of $4,000,000.00. Of this total, production equipment represents at least $3¼ million. In productive capacity, the plant is capable of turning out close to 600 units in a two-shift day.

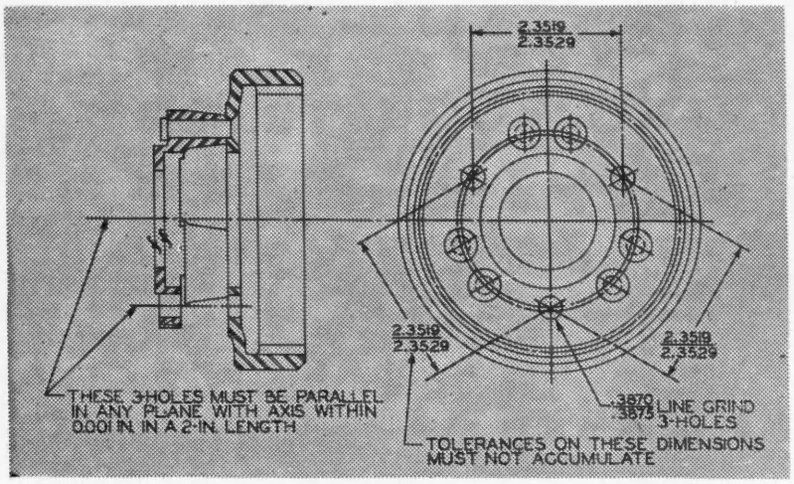
As a starting point in this development, the transmission was laid out on a table and each individual part subjected to close study against the blue prints. Since there was no precedent for a job of this kind, it was necessary to work precisely to the dimensional tolerances indicated by the engineers and it constituted the first case in years where the production department had no alternative as to modifications in design or compromises in the manufacturing limits.

At first glance, the details provided a disconcerting array of precision elements with tolerances rivaling any other part of the car. How varied these requirements might be, may best be judged from the fact that this transmission comprises a total of 799 individual pieces—300 different symbols—and includes 54 sub-assemblies.

The most vital of the first decisions was that the transmission was more nearly a job for engine specialists than for transmission men. It would be built and supervised by engine men with the aid of transmission builders where gear and shaft production was concerned. And sure enough, those who know the Buick factory men will recognize that the men in charge are those who previously built Buick engines.

For six months the general superintendent of the new division lived in the master mechanic's department, laying the initial plans. They recognized the fact that the transmission case was more analogous to a cylinder block than it was to a conventional case. The routing shown later in this article, together with views of the equipment will show how closely this analogy fits. It was decided that the head-end gear train was sufficiently like the conventional transmission to offer no special problems. However, there were three internal gear elements that offered seemingly formidable problems. In an effort to find the solution in current practice, the superintendent visited a number of plants making internal gear elements in current production but came away with the feeling that Buick would have to work out its own salvation in some different fashion.

Came the intermediate stage of the program where the production department in cooperation with the master mechanic's staff set up a preliminary routing for each individual part, indicating here and there some special items of equipment that might have to be developed for an operation. At this stage they drew on the mechanical talents and the wide production experience of the machine tool builders. Certain parts were turned over to leading



Example of precision indexing as developed for the self-shifting transmission

This is the front carrier assembly consisting of a hardened gear and a soft spider riveted together. The three holes have been previously drilled and reamed. In this operation, they are line-bored on a Bryant chucking grinder, using the hand-indexing fixture described

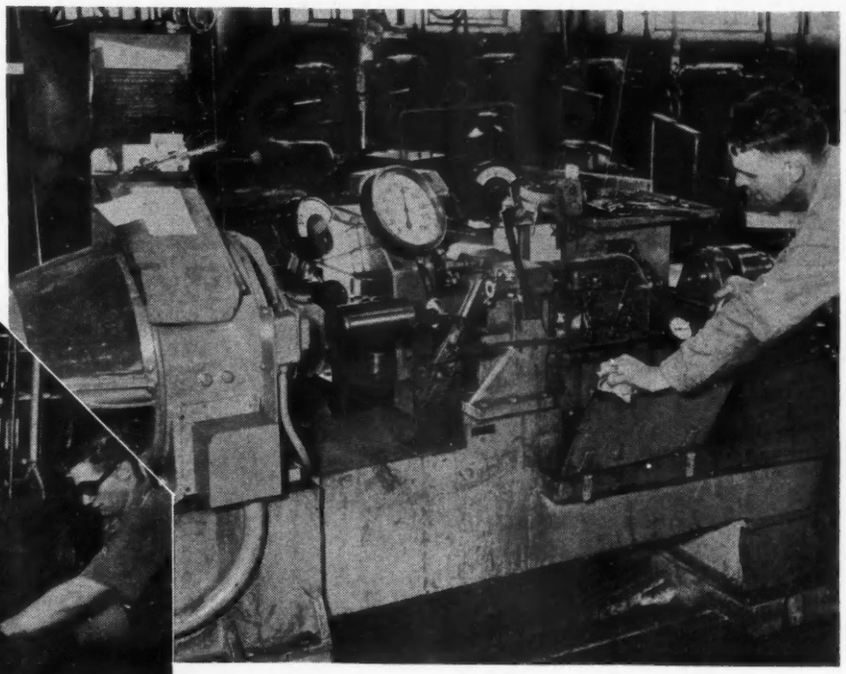
experts in their respective fields with the request for an analysis of the job and specific recommendations for special equipment and tooling. As the returns came in they were compared with the preliminary routings established by Buick. Then ensued the stage when the machinery experts and the Buick men compared notes and made the final compromises that seemed most acceptable.

The final layout represented the product of intensive study and planning. It is unique to the extent that much of the equipment is new or novel and designed to produce its operation exactly to the engineering drawings. Thus a particularly difficult job was brought right down to a commercial reality through the cooperation of machinery builders.

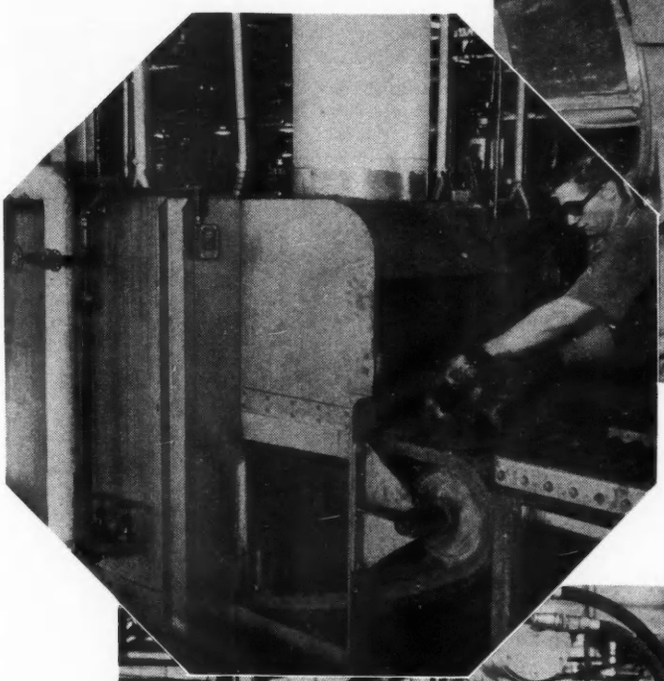
Given any other set of conditions or restrictions such as, for example, the usual procedure of having to build the special transmission in an existing

Factory Routing Transmission Main Shaft

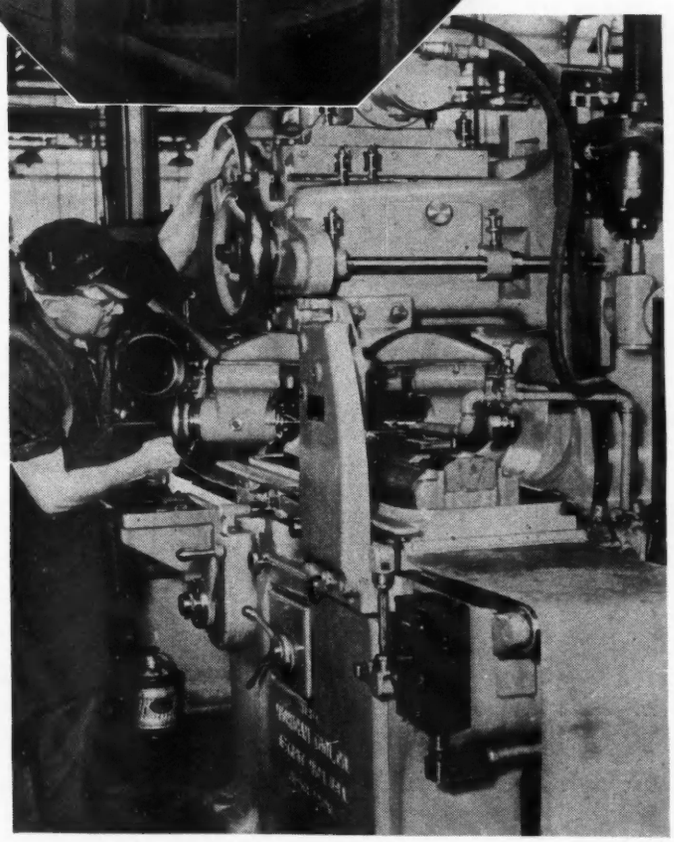
OPERATION	EQUIPMENT
Drill 0.3281 in. hole full length of shaft	14 in. 4-spindle Leland-Gifford drill press
Spotface both ends to 10.655-10.662 length	No. 2 2-spindle Avey drill press
Center both ends	No. 2 Avey drill press
Rough and finish outside diameter 0.760-763 in., and gear diameter 1.550-1.555 in. diameter, and bearing for (3) roll steady rest, and undercut in gear 1.150-1.160 in., and recess 1.105-1.115 in. diameter and break sharp corners	5x12 in. Model U Lo-Swing automatic lathe
Break down stock on splined end to 1.022-1.040 in. undercut 1.105-1.115 in. Recess at 45 deg. angle	13 in. LeBlond lathe
Rough and finish turn 0.620-0.630 in., diameter 0.750-0.753 in., diameter 0.867-0.871 in., diameter 1.000-1.005 in., diameter 0.895-0.898 in., groove 1.153-1.156 in., bearing diameter 0.960-0.970 in. recess and break sharp corners	5x12 in. Model U Lo-Swing automatic lathe
Mill (2) .02487-0.250 in keyslot	24 in. Cincinnati Duplex automatic milling machine
Locate from keyslots drill (4) 0.1875 in. holes (1) 0.1562 in. hole and (3) 0.2187 in. holes	No. 4-B.M. Fosdick 2-spindle drill press
Burr all holes and inside of 0.3437 in. holes	Type FBA, Cincinnati electric speed lathe No. 44629
Grind outside diameter of splines 0.985-0.986 in.	10x18 in. Type C Norton semi-automatic cylinder grinder
Grind for indicating and steady resting while cutting teeth 1.135-1.136x3-17/64 in. long	10x18 in. Type C Norton semi-automatic cylinder grinder
Finish turn gear diameter 1.538-1.540 in. and pilot diameter on gear end 0.750-0.753 in.	11x4 in. LeBlond lathe
Hob 10-splined section	4-spindle Lees - Bradner rotary hobber
Hob 17-external teeth	8-spindle Cleve'and rotary hobber
	Bench
Cut 7/8-16 in. American National Thread 0.8312-0.8344 P. D.	Hanson & Whitney thread milling machine
Chamfer acute angle on both ends of teeth on one 17-tooth gear	Lipe Rutac tooth burring machine
Chamfer acute angle on both ends of teeth of 17-tooth gear	Lipe Rutac tooth burring machine
Shave 17-external teeth. Shave both 17 external teeth steady rest on 1.135-1.136 in. diameter when green ground	National broach & machine com. Model CC
	Gear finishing machine
	Fellows gear generator
	Note: Set in for tryout machine gear finishing machine
Inspect (gear laboratory)	Bench
Clean	Conveyor type Detrex automatic degreaser
Heat treat, harden and draw	Holcroft furnace
Inspect, metallurgical grind for Rockwell and test hardness	Polishing jack
Polish centers	No. 14 in. Leland-Gifford drill press
Straighten	No. 13 Toledo press
	Morse Twist Drill and Machine Company straightening press
Clean scale from all holes. Brush scale from outside diameter of spline and gear	No. 108 Ranson grinding machine
Grind 0.7345-0.7355 in. short end	6x18 in. type C Norton semi-automatic cylindrical grinder
Grind 0.7345-0.7355 in. long end	6x18 in. type C Norton semi-automatic cylindrical grinder
Finish grind 1fi1235-1.1245 in. diameter 3-17/64 in. long	10x18 in. Model C Norton semi-automatic cylindrical grinder
Grind to length from gear to end 7.064-7.068 in. and overall length 10.637-10.641 in.	No. 3 abrasive grinder
Inspect (Floor)	
Wash and blow out	
Inspect (Gear Lab.)	Bench



(Below) After machining, the transmission cases are thoroughly freed of chips, dirt, grease and oil by treatment in this No. 80 Blakeslee washing machine



(Above) All self-shifters are tested for their ability to think and act automatically on this machine equipped with variable speed motor. After assembly, the transmissions are put through a heating oven that heats them up to 200 deg. Fahr. for this test



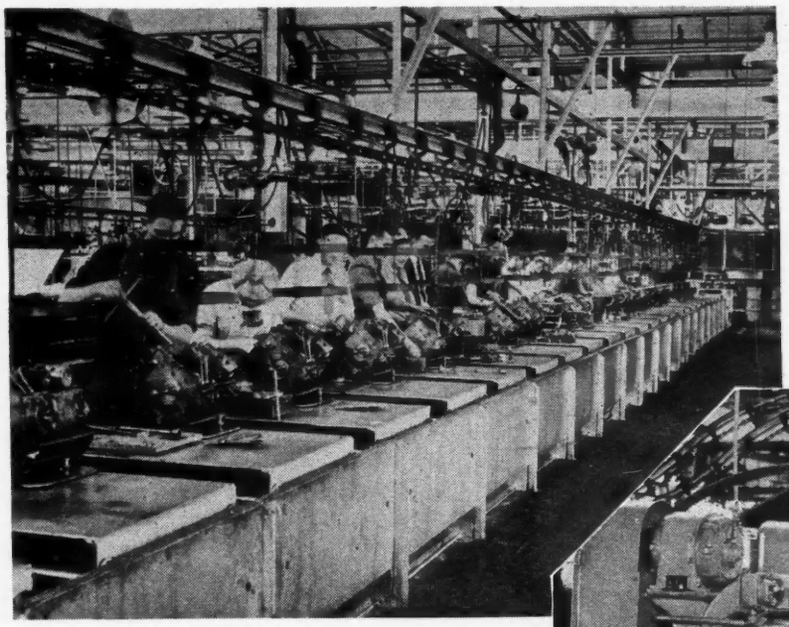
External gears are all shaved in the green on a battery of Michigan Tool gear shavers

plant with the need for utilizing existing equipment—the result might have been quite different.

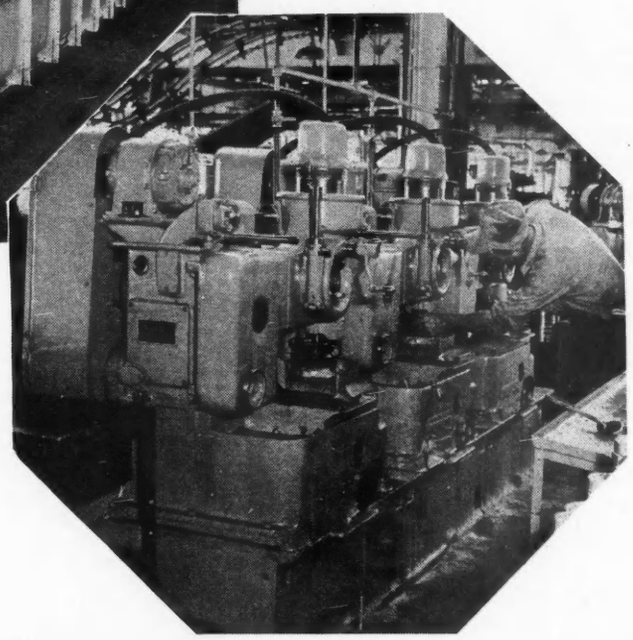
Having a free hand and almost unlimited resources for equipment expenditure, this transmission plant has been provided with features that are almost beyond the fondest dreams of the production man. It is a show place so far as machinery lines are concerned and is completely self-contained as to process from the receiving inspection to the shipping dock.

Here is the master gage department fitted with the latest gear checking equipment and housed in a temperature-controlled room. Room temperature is maintained precisely at 72 deg. Fahr. by a special Frigidaire installation. Each department is provided with a complete set of Illinois checking fixtures. Two huge sound rooms—one for head end units; the other for planetary units—have been provided, including a fine installation of the Red Ring sound testers.

The transmission building is divided into a number of departments so arranged as to facilitate the economical routing of work. One section is set apart for the head end which comprises, in the main, the conventional types of gears and shafts. Another section takes the planetary end including the internal gears. In addition, the operations are further sub-divided by grouping all



(Left) Perspective of self-shifting transmission assembly line showing detail of table height conveyor and trunnion type holding fixture

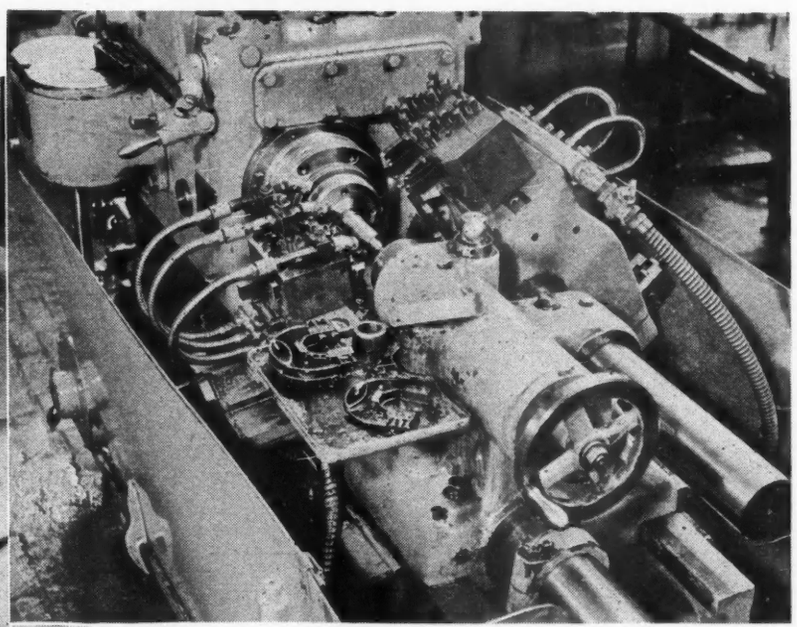


Group of Fellows high-speed generators

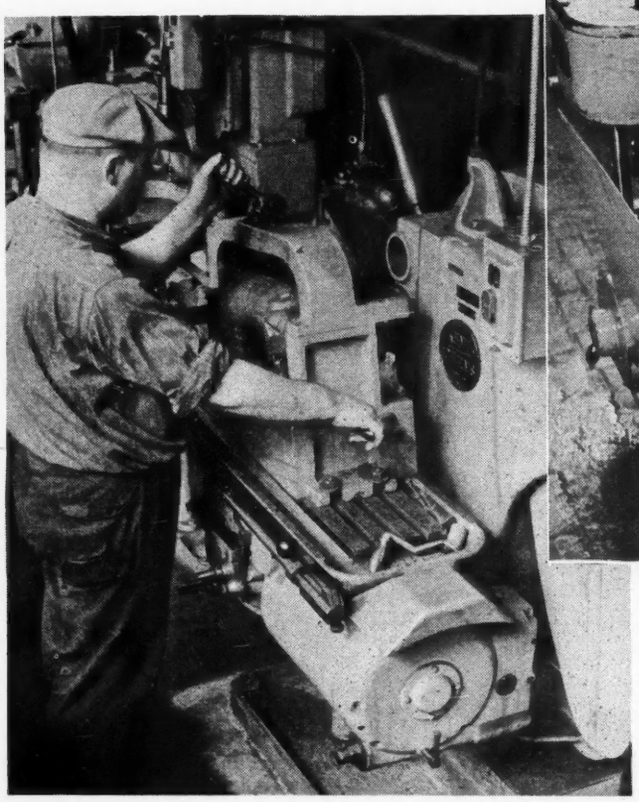
equipment for soft gears at one end and concentrating all grinding operations after heat-treat in another section.

The transmission case is set up in a separate department as are the heat-treat and lapping operations.

In general, the gears are given the most complete treatment known to the art. Gears are cut by hobbing on eight-spindle Cleveland hobbers or on a bat-

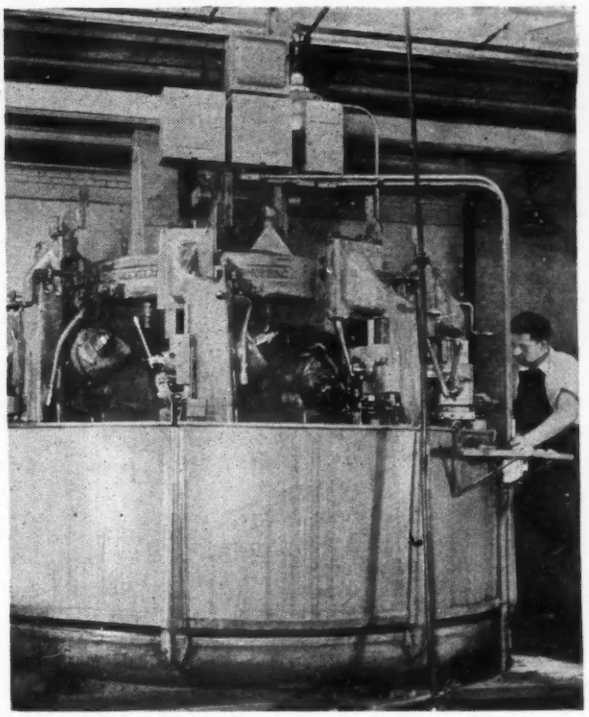


Close-up of tooling on one of the Fay automatic lathes



(Left) Two bosses in case side opening are milled on this No. 26 Kent-Owens cam-operated miller

tery of the new high-speed Fellows gear shapers, depending upon design and quantity requirements. All external gears then are shaved on Michigan Tool shaving machines while internal gears are shaved on Red Ring gear shavers That's in the green. After heat treatment, all gears are lapped using a battery of special Inco laps for some and a new battery of Ex-Cell-O lapping machines for others. The latter were developed especially for this transmission and will not be found anywhere else in the industry at this writing.



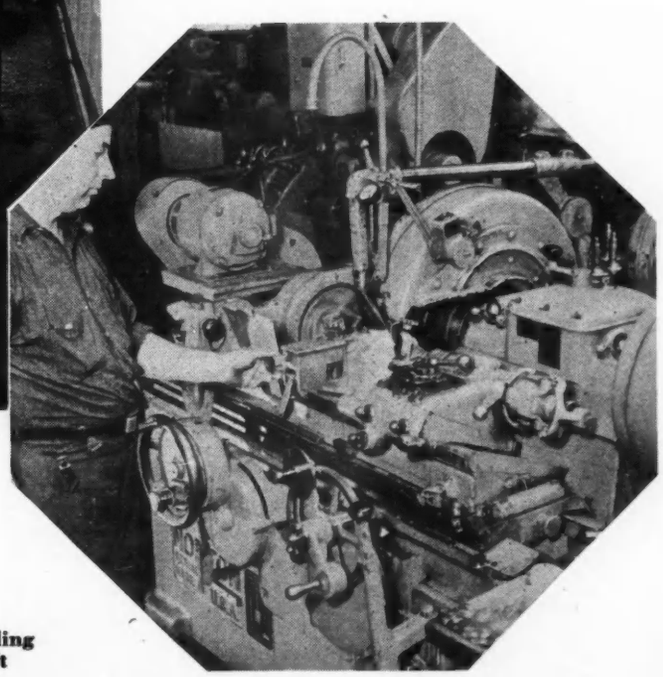
Eight - spindle Cleveland hobbing machine set up for hobbing transmission gears

Heat treatment of the internal gears, particularly the stem gear with its acute changes in mass and cross-section, posed an unusually difficult problem. Not the least of the complications arose from the fact that fire distortion could not be tolerated because of the fine tolerances specified for roundness and trueness of gear form—an essential to quietness. The solution was found in the design of a special Gleason quenching machine. There are three of these machines in the heat treat, one for each of the three internal gear blanks.

For heat treatment, Buick has adopted the Holcroft controlled atmosphere carburizing furnace, of which the first installation in the industry was found in the Buick main transmission plant about two years ago. A medium-sized furnace with hand feed, adjacent to the three Gleason quenching machines is used for hardening the internal gears; a large furnace, similar to first unit installed at Buick but incorporating some improvements, is used for hardening the other gears. This unit is completely automatic in action —feeding and quenching automatically with quenching in a controlled atmosphere.

Without throwing unusual emphasis upon any of the equipment found in this

View in the sound test room showing battery of Red Ring sound testing machines.



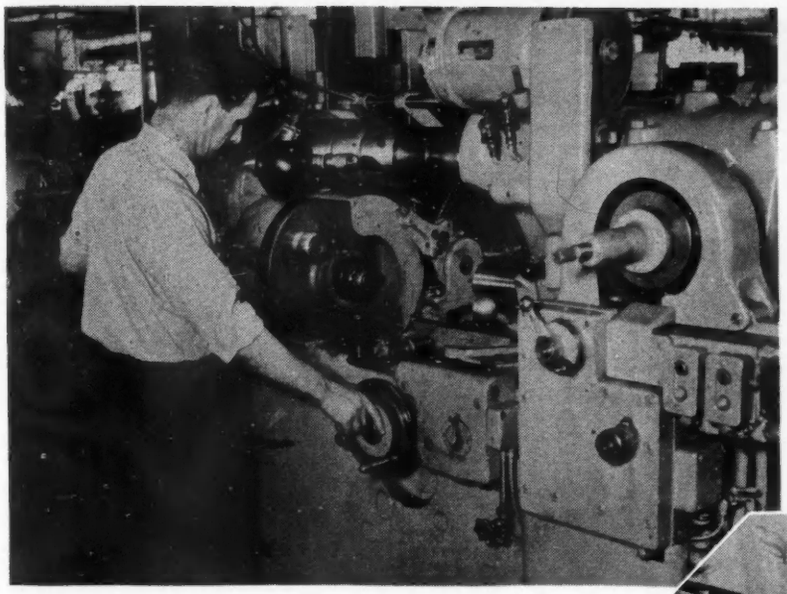
Type C Norton grinder at work finish-grinding outside diameter on transmission main shaft

Factory Routing Transmission Case

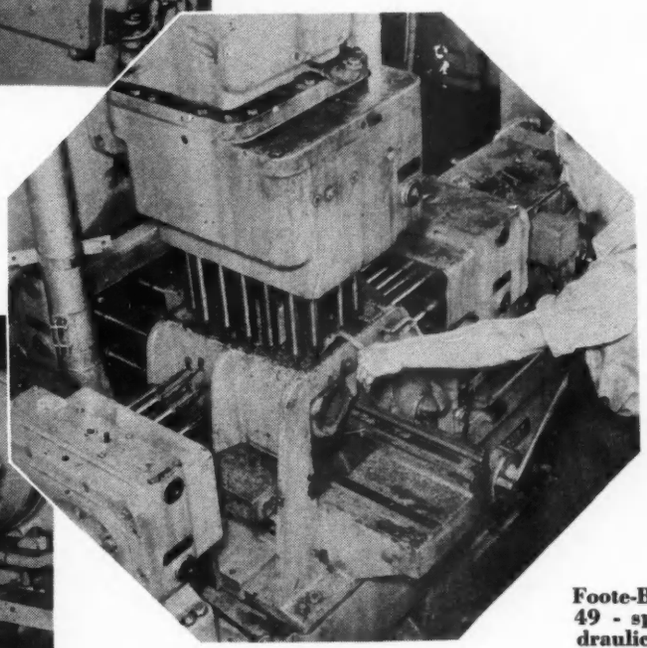
OPERATION	EQUIPMENT
Rough and finish mill bottom face	4-spindle drum type Ingersoll mill
Drill and ream (2) locating holes	"S" 4-H Natco horizontal hydraulic drill
Rough and semi-finish mill both ends	4-spindle Ingersoll drum type miller
Rough and finish mill both sides	4-spindle Ingersoll drum type miller
Finish mill (2) 1 5/16 in. diameter bosses	Ingersoll 4-spindle traveling head miller
Mill 1¼ by ⅜ in. wide in left hand side	24 in. Cincinnati plain automatic mill
Mill control valve pad in side opening	Cincinnati 24 in. wide bed automatic face milling machine
Drill (1) 3/16 in. oil hole 2⅞ in. deep in bottom	No. 2 14 in. single spindle Leland-Gifford drill
Mill (2) ¾ by ½ in. bosses in side opening	No. 26 Kent-Owens cam operated milling machine
Finish mill bottom of bearing cap pads	Cincinnati standard 24 in. wide bed face miller
Finish mill (4) bosses in dome of case to 7.060-7.070 in. diameter	Ingersoll single spindle horizontal traveling head miller
Mill 4.640-4.645 in. diameter counterbore inside opening	Foote-Burt vertical boring machine
Drill front end, bottom surface, top surface and right hand side (17-spindle)	Foote-Burt 4-way 17-spindle unit type hydraulic semi-automatic drilling machine
Upper head 3-spindle—drill 3 holes	
Left hand head 4-spindle—drill 4 holes	
Right hand head 6-spindle—drill 5 holes	
Back head 3-spindle—drill 3 holes	
Drill rear end, bottom surface, left hand side and spotface and ream top surface	Foote-Burt 4-way 22-spindle unit type hydraulic semi-automatic drilling machine
Upper heads 4-spindles	
Drill rear end, drill (4) 7/16-14 in. tapped holes "U" 0.368 in.	
Left hand head 6-spindles—drill 5 holes	
Right hand head 6-spindle—spotface 4 holes, ream 1 hole	
Back head 6-spindle—drill 6 holes	
Drill bottom surface right hand side, left hand side and front end	Foote-Burt 4-way 49-spindle unit type hydraulic semi-automatic drilling machine
Upper head — 22-spindles — drill 22 holes	
Left hand head—7-spindles—drill 7 holes	
Right hand head—15-spindles—drill 15 holes	
Back head—5-spindles—drill 5 holes	
Drill 2 holes in valve control body pad in left hand side on 25 deg. angle	1-spindle Fosdick drill

OPERATION	EQUIPMENT
Drill 2¼ in. angular oil holes in bottom face	No. 2 20 in. Leland-Gifford drill
Tap (2) holes in center bearing pad	24 in. Cincinnati Bickford drill
Assemble dowel pins	Conveyor
Rough bore 5 holes	Ingersoll 5-way 8-spindle boring machine
Mill angular groove in front end of case	Ingersoll rotary head miller
Finish face 8 holes	Ingersoll 4-way 8-spindle boring machine
Remove center bearing cap	Conveyor
Mill center bearing lock slot and burr	24 in. wide bed Cincinnati face miller
Ream dowel hole in right hand side core drill to 19/32 in. diameter and 2 shifter shaft holes in line in left hand side	Buick special drilling reaming machine
Mill bearing lock slot in bracket, reverse countergear	No. 1 Kent-Owens hand mill
Line ream 2 holes in left hand side	24 in. Cincinnati drill
Assemble (1) bushing (1) bracket	3-Ton Oilgear vertical press
Burnish bushing in assembly bracket reverse countergear	3-Ton Oilgear vertical press
Drill (3) holes in assembly bracket reverse countergear	14 in. Leland-Gifford single spindle drill
Assembly (1) bracket reverse countergear and (2) cap screws to center bearing pad	Conveyor
Finish ream in line bushing in bracket reverse countergear to 0.437-0.438 in. diameter	Conveyor
Hand ream hole and select fit idler and countershaft	Conveyor
Finish face front end	LeBlond heavy duty lathe
Precision face valve body pads	No. 2112 Ex-Cell-O single end junior machine
Tap top surface and left hand side	Foote-Burt 2-way 2-spindle unit type lead screw semi-automatic tapping machine
Tap top surface in upper head 5-spindles use 4-spindle only. Tap 4 holes	
Tap left hand side in back head 15-spindle tap (15) holes	
Tap bottom front rear end and right hand side	Foote-Burt 4-way 32-spindle unit type lead screw semi-automatic tapping machine
Tap bottom surface in upper head 19-spindle. Tap 19 holes	
Tap front end in left hand head 4-spindle tap 4 holes	
Tap right hand side in back head 7-spindle tap 7 holes	
Wash	No. 80 Blakeslee washing machine
Inspect	Bench

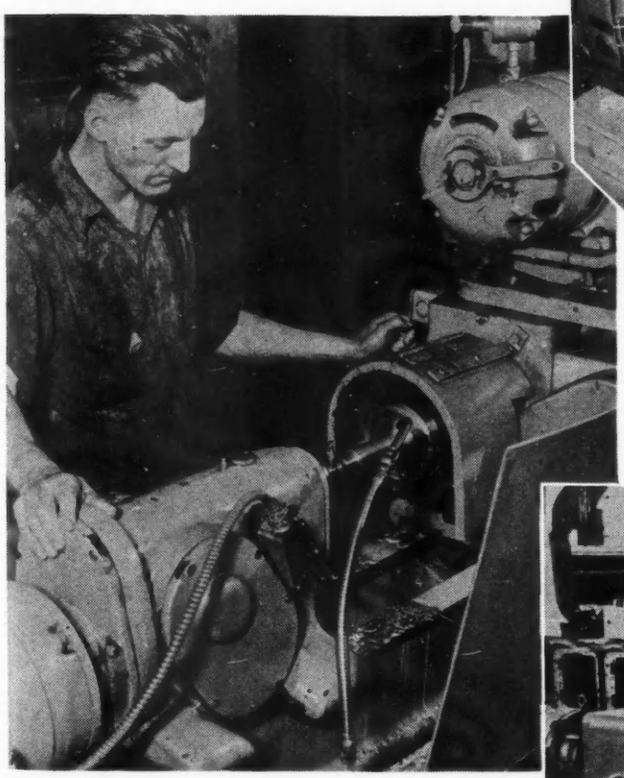
plant, we believe it is of interest to note certain items that are to be found in large batteries. In this category, one will find—eight of the towering and familiar Bullards; seven of the new eight-spindle Cleveland hobbing machines; three of the new Lees-Bradner hobbers used for cutting involute splines on shafts; ten Ex-Cell-O internal gear lapping machines; a battery of 16 National Acme automatic chucking machines; close to 40 precision boring and facing machines by Heald and Ex-Cell-O; and about 40 of the new high-speed Fellows gear shapers.



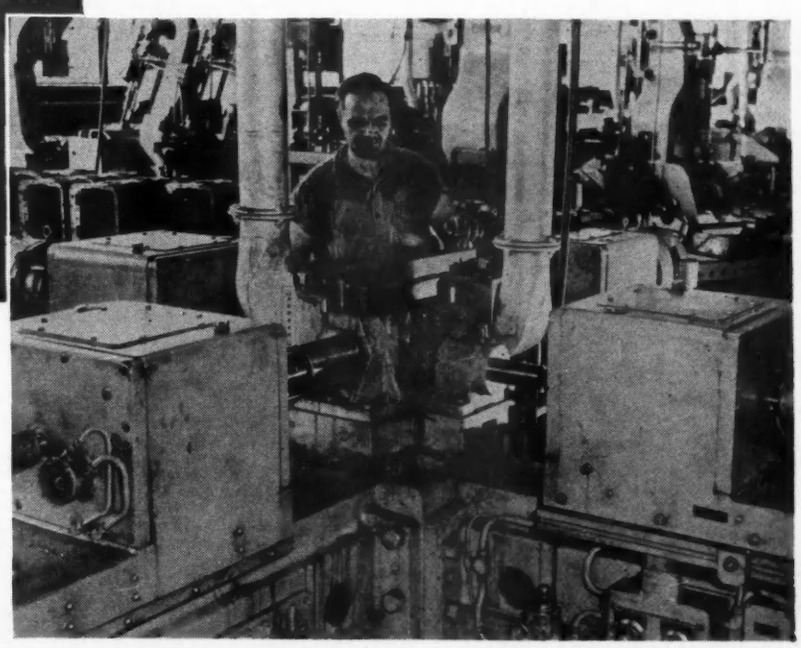
Bryant chucking grinder with three-position, hand-indexing fixture for line-grinding three holes in carrier assembly



Foote-Burt 4-way, 49 - spindle hydraulic drilling machine on transmission case



Recentering driving gear blank on Sundstrand centering machine



(Right) Ingersoll 5-way, 8-spindle boring machine line-boring transmission case

The transmission as it comes off the assembly line is as different from the conventional job as it is in the manufacturing process. Not only must it pass muster in the quiet room but it has to satisfy the inspectors as to its ability to "think" and act automatically under stated conditions. To assure this requirement, each transmission is put through its paces on a special testing machine. As the assembly operations are completed, the unit is hooked onto a monorail which moves through a compact, narrow heating oven arranged to bring the whole assembly to a temperature of 200 deg. Fahr., this being the temperature at which the hydraulic system operates in the car.

Transmissions are taken off the conveyor as they emerge from the oven and are run 100 per cent in one of two testing machines fitted with variable speed driving motors and suitable instrumentation. Each unit is tested according to the following schedule:

Functional Specifications:

The following functions to occur as specified with oil having equivalent viscosity of S.A.E. 20W at 200 deg. Fahr.:

1. Set throttle control valve lever so that compensator pressure starts to cut off at 0.090 to 0.110 outside lever travel at the pin hole and the pressure must be 15 to 25 pounds at 0.200 total travel at 1000 r.p.m. in third gear.

Total travel of outside lever must be a minimum of 0.680.

Throttle downshift fourth to third gear must occur with 0.600 to 0.640 travel of the outside lever at 2000 r.p.m.

2. Transmission pressure upshift first to third gear must occur at 850 to 1000 r.p.m.

3. Automatic upshift third to fourth gear must occur at 1250 to 1330 r.p.m.

4. Forced shift third to fourth gear must occur at 3650 to 3850 r.p.m.

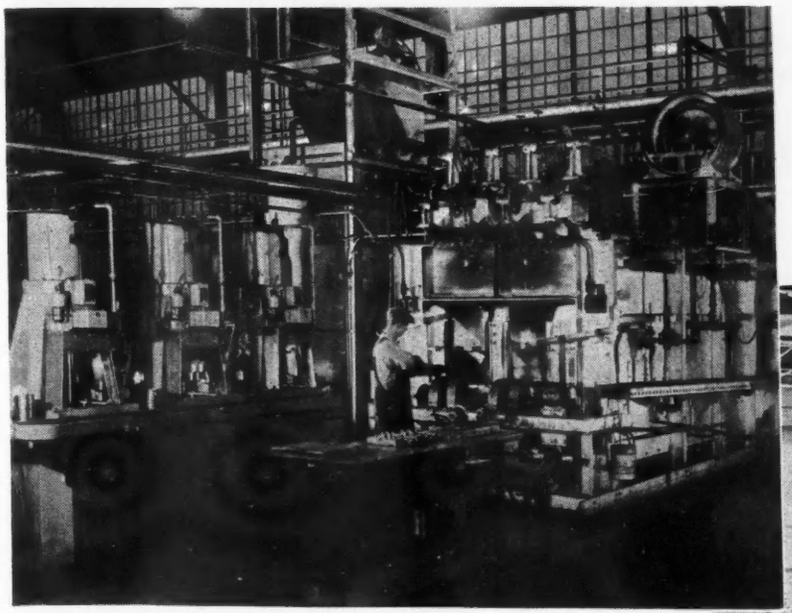
5. Lockout of throttle downshift fourth to third gear must occur at 2300 to 2500 r.p.m.

6. Lockout of downshift to second

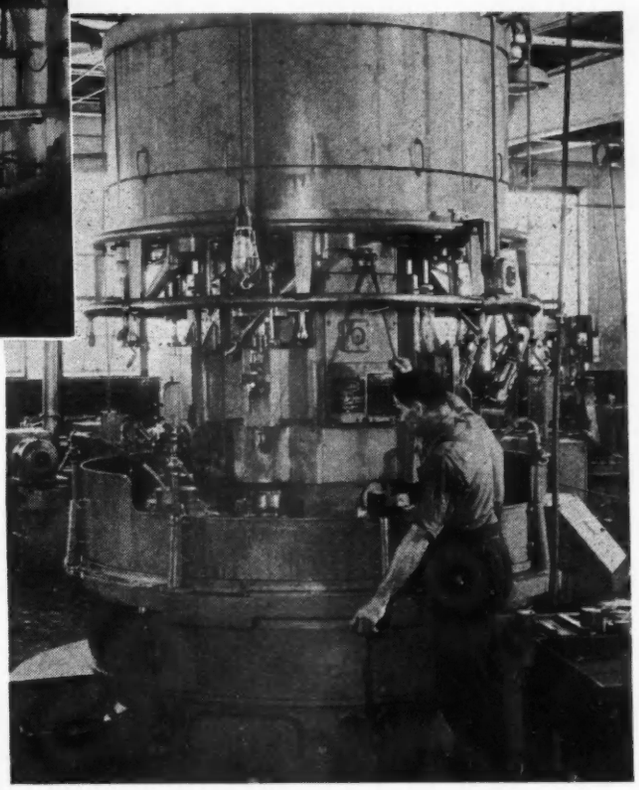
Factory Routing Gear-Driving, Front Unit

OPERATION	EQUIPMENT
Semi-finish face gear end, semi-finish bore gear diameter, finish turn face and bore all other surfaces on gear end	8 in. 8-station Bullard machine
First Station: load	
Second Station: Rough bore inside drill part way, rough turn outside diameter part way	
Third Station: Rough outer gear face, rough bottom outer face part way, rough 30 deg. bevel and bottom inner, face, rough, back face part way	
Fourth Station: Semi-finish bore inside diameter, finish drill, rough turn outside diameter, part way, rough back fac eand turn 45 deg. chamfer	
Fifth Station: Finish outer bottom face and 30 deg. bevel-spool bore	
Sixth Station: Finish bottom of inner face and cut recess back of teeth, chamfer 1/16 in. 45 deg. and ⅛ in. by 45 deg.	
Seventh Station: Finish bore bushing and thrust bearing hole and chamfer gear tooth diameter	
Eighth Station: Finish bore, turn and face combination ream bushing and thrust bearing hole	
Drill (4) ½ in. holes in flange	21 in. Cincinnati drill
Burr both sides of drill hole	Fosdick drill press
Center stem end	Sundstrand centering machine
Drill 31/64 in. hole through stem	No. 2 14 in. 4-spindle hydraulic step-by-step feed Leland-Gifford drill press
Rough turn stem and pilot	12 by 15 in. Fay automatic lathe
Spotface to length	Leland-Gifford drill press
Re-center	Sundstrand centering machine
Finish turn stem and pilot	12 by 15 in. Fay automatic lathe
Green grind bearing diameter	10 by 18 in. Landis grinder type C

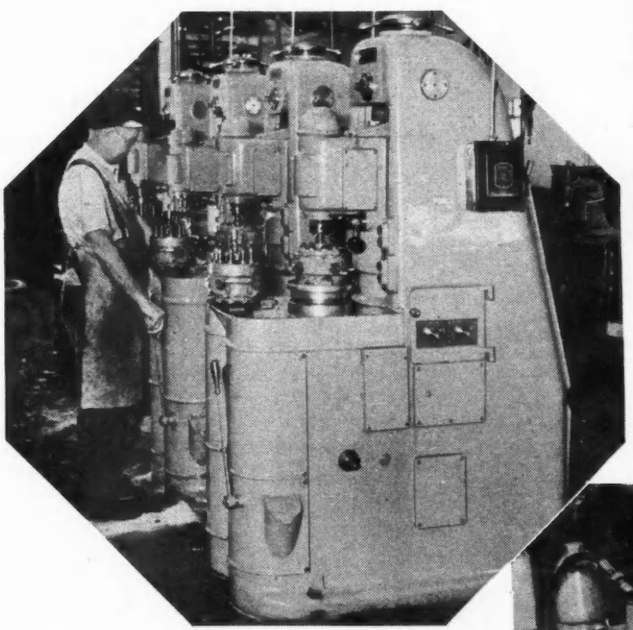
OPERATION	EQUIPMENT
Green grind pilot diameter	10 by 18 in. Landis grinder type C
Finish face gear end and finish bore (gear diameter)	17 by 5 in. LeBlond lathe
Drill 3/32 in. hole and countersink to 5/32 in. diameter	No. 2 Avey 2-spindle drill
Drill (4) 3/16 in. oil holes	No. 2 2-spindle Aveymatic
Polish centers	No. 2 Aveymatic 2-spindle drill
Green grind outside diameter of gear end and back face	10 by 36 in. type C Landis plain hydraulic grinder
Cut 55 teeth	Special No. 715 Fellows gear shaper
	Bench
Hob 12 helical splines	4-spindle Lees Bradner hobbing machine
Face 0.750 in. hole to depth	No. 2 single spindle Avey drill
Cut (2) 1/16 in. recess in 1.306 in. diameter	8 in. Sundstrand stub lathe
Drill No. 23 hole in 1.306 in. diameter and burr ho'e	No. 2 Avey 2-spindle drill
Finish shave 55-14 pitch internal teeth	National Broach & Machine Co. gear shaver
Inspect (gear lab.)	Bench
Wash	Conveyor type Rex automatic degreasing machine
Heat treat	Holcroft furnace
Quench in oil and check	15 in. Gleason quench machine
Wash	Tank
Clean centers both ends and brush scale from hole	Cincinnati electric speed lathe
Draw	Draw furnace
Metallurgical inspection	No. 4-M Rockwell test machine Ranson grinder
Brush scale from gear teeth and splines	Bench
	No. 108 Ranson grinder
Finish step grind 1.340-1.341 in. and 1.306-1.307 in. diameters and touch back face	6 by 18 in. type C Landis plain hydraulic grinder
Grind center in 0.8405 in. hole	75-A Heald internal grinder
Finish grind 0.7340-0.7350 in. pilot and stone edges of 1 7/32 in. recess to remove burrs	6 by 18 in. type C Landis plain hydraulic grinder
Grind end of stem to 3.151-3.155 in.	No. 3 Abrasive grinder
Inspect (floor)	
Wash and blow off	
Inspect (gear lab.)	



Discharge end of hand-feed Holcroft gas-atmosphere carburizing furnace which is used exclusively for case-carburizing the three internal gears. At the side are seen the three Gleason quenching machines, one for each of the gears. The one nearest the furnace handles the stem gear

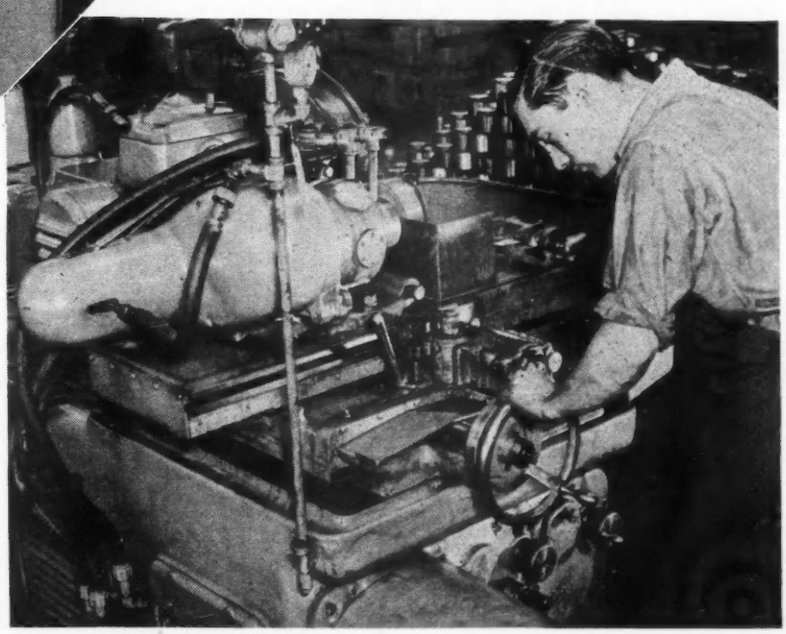


(Right) Six-station Bullard Mult-Au-Matic, one of a large battery in this plant, is seen set up for the drum (front unit clutch)



View of part of battery of the new Ex-Cell-O gear lapping machines used for finishing internal gears after heat treatment

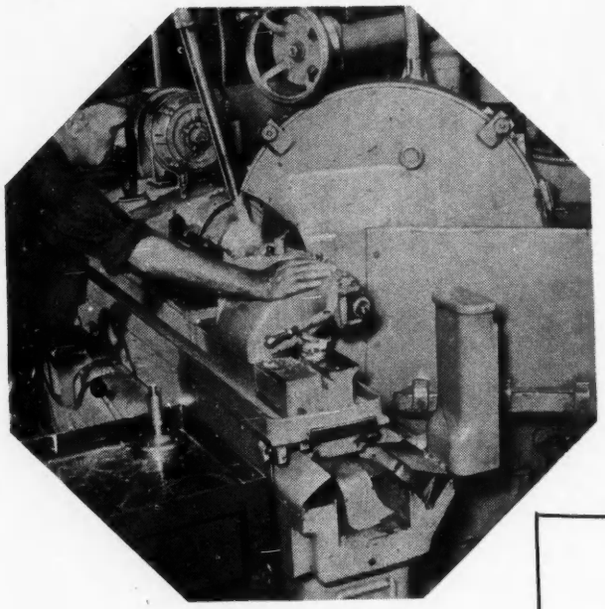
(Below) Cincinnati chucking type grinder finish - grinding outside diameter of drums



gear with the outside lever against either the idle or wide open stop should occur at 2000 to 2500 r.p.m.

7. Automatic downshift fourth to third gear must occur at 750 to 625 r.p.m.

8. Pressure downshift must occur not higher than 200 r.p.m. Oil pump pres-



Type C Landis hydraulic grinder green - grinding outside diameter of driving gear

sure at which downshift occurs must be 40 to 46 lb.

9. Forced shift first to second gear should be at 2400 to 2600 r.p.m.

10. Check for leakage in valve body. With shift lever in low position there must be no pressure shown on compensator gage when outside lever is in idle position.

A new set-up of this kind offers a signal opportunity for tool research. They have tooled all precision boring and precision facing operations with Carboloy-tipped fly-cutters, although there are a few exceptions where the diamond is being used. Ramet has given a good account of itself on steel turning and is found on the Bullards and on the Sundstrand stub lathes.

If we were asked to single out the most characteristic operations performed in this plant, we would say without hesitation that basically they have built the job around three techniques:

Precision boring
Precision facing
Precision indexing

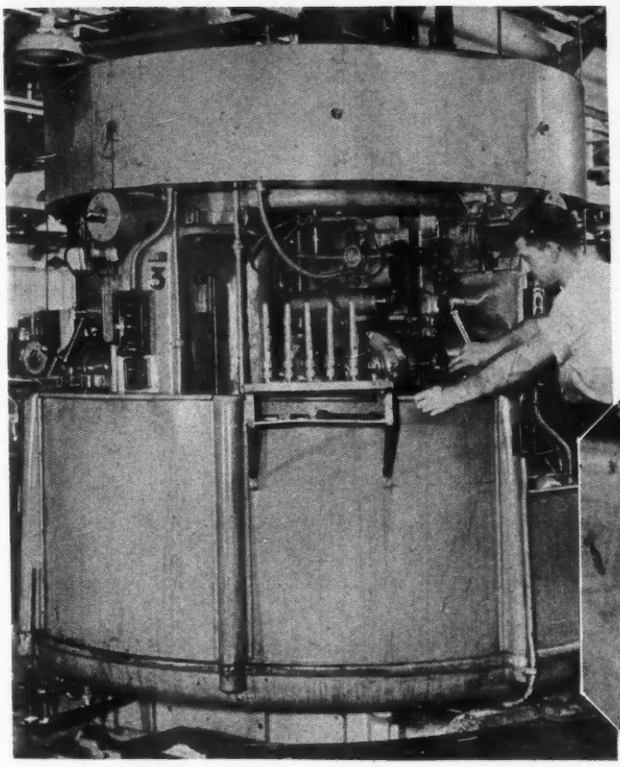
The routing of the "front unit clutch drum" is an excellent example of precision boring, presenting three separate settings on precision boring machines.

Precision indexing is best exemplified in the finishing operation on the rear unit front carrier assembly, illustrated here. As shown on the sketch, this assembly consists of two separate parts—an internal gear and a spider forging, riveted together after machining. The complication arises from the fact the three equally spaced holes are held for spacing, hole-to-hole, within a total tolerance of 0.001 in., and the tolerances are not permitted to accumulate around the circle. On the individual parts, the holes are drilled and reamed on a circle which is held concentric with the pitch diameter of the internal gear teeth within 0.002 in. total indicator reading.

After assembly (riveting and staking) the unit is routed to a battery of Bryant chucking grinders for finish-grinding the three holes. In this operation, the holes are line-ground through the two pieces so as to provide the final location for the planetary gear pinions. An added complication is the fact that the spider forging is soft while the gear blank is hardened to

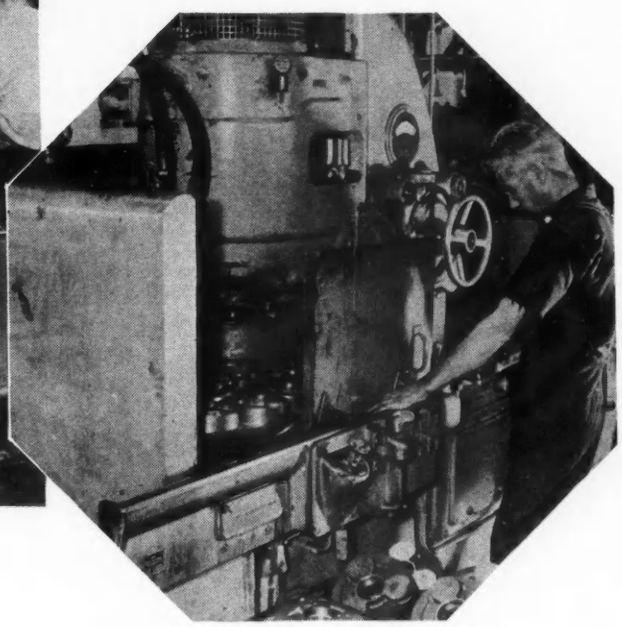
Factory Routing for Drum—Front Unit Clutch

OPERATION	EQUIPMENT
Turning, facing, boring operations	8 in., 6-station type D Bullard mult-au-matic single index
First station	
Second station—rough turn outside diameter, rough turn inside diameter, rough bore hole, break down inside face	
Third station—rough face rim, rough face inside of web and chamfer both ends of hole	
Fourth station—semi-finish, turn outside diameter, semi-finish bore large hole and semi-finish face rim and inside of web	
Fifth station—finish bore small hole face inside of web and rim	
Sixth station—finish ream hole finish turn outside diameter, finish bore and chamfer large hole	
Surface grind closed end	No. 18 Blanchard high power vertical surface grinder
Rough and semi-bore 1.725-1.729 in. finish face bottom undercut and chamfer (3) piston holes	Foote-Burt drum type horizontal spindle machine (6-station index)
Drill (9) holes and semi-finish ream (6) holes to 0.3595-0.3615 in. and burr	Foote - Burt hydraulic semi-automatic drill (3 station index)
Drill (3) 5/32 in. diameter holes in hub	14 in. Leland - Gifford drill press, single spindle
Tap (3) holes	No. 2-X Garvin tapper
Finish grind outside diameter	No. 1 Cincinnati semi-automatic chucking type grinder
Precision bore rabbet and hole in hub	Ex - Cell - O single end junior precision boring machine
Precision bore (6) to 0.3735-0.3755 in. diameter	Ex - Cell - O single end junior precision boring machine
Precision bore (3) piston holes	Ex-Cell-O No. 2112 single end junior precision boring machine
Burr all holes	Type F.B.A. Cincinnati electric speed lathe
Balance statically	GMC small type sensitive static balancer
Inspection	
Wash	



One of battery of eight-spindle Lees-Bradner hobbing machines used for cutting involute splines

Planetary drum faces finish-ground on this Blanchard vertical surface grinder



Rockwell C 50-53.

This precision indexing operation is quite unusual. The work is mounted on a three-position, hand-indexing chuck mounted eccentrically on the face plate so that each hole when indexed for position will line up exactly on the spindle center. In practice, it was found necessary to fit the face plate with a balance weight so as to eliminate misalignment due to the eccentric mounting on the chuck.

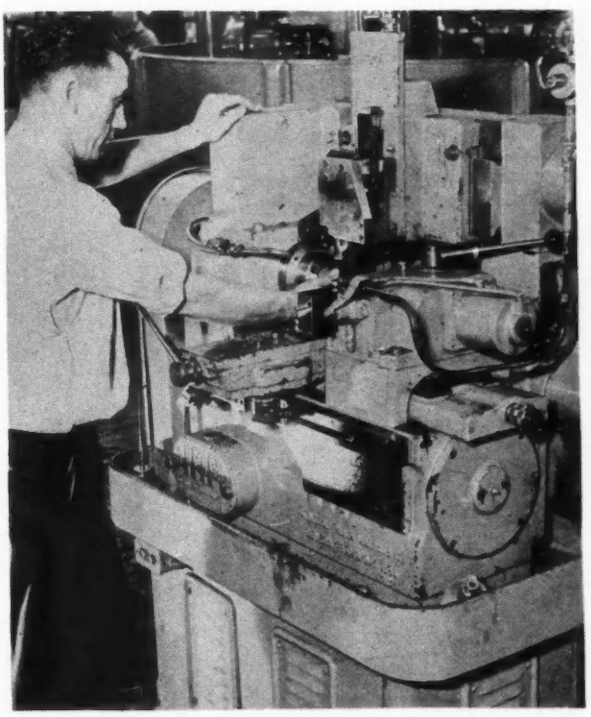
The routing of the transmission main shaft with its two separate gears is given here as an example of the gear production process. In addition, we have shown the routing of the internal stem gear which is representative of the work involved in the production of the three internal gear members.

The routing of the transmission case is most interesting. It is more nearly like a motor block with equipment of that character except for size. Some of the Ingersoll machines, particularly the battery used for rough and finish-boring, are entirely new examples of tools of this kind.

Among the more complex pieces of equipment on the case line are the following Foote-Burt and Ingersoll machines:

1. Foote - Burt four - way, unit - type hydraulic semi-automatic drilling machines
   a. One 17-spindle unit
   b. One 22-spindle unit
   c. One 49-spindle unit
2. One Foote - Burt four - way, 32-spindle, semi-automatic tapping machine.
3. One Foote - Burt two - way, 20-spindle, semi-automatic tapping machine.
4. One Ingersoll five-way, 8-spindle boring machine.

(Turn to page 363, please)



Lo - Swing lathe turning transmission main shaft

United Parcel Develops Truck

(Continued from page 338)

The conventional body tunnel is eliminated by a two-piece propeller shaft, mounted in a self-aligning center bearing.

Steam cooling eliminates the fan and radiator out in front, providing more payload space. However, the company feels that the greater economy of operation is probably a more valid reason for employing this type of cooling. The engine temperature is brought up to 212 deg. F. almost immediately upon starting, and is held virtually at that point. Under heavy operating conditions, such as grades, steam is simply generated a little faster than otherwise, and is condensed faster. The engine cannot run too cold, because there will be no cooling until the engine gets hot enough to generate steam in the water jacket.

Throughout the design, component parts have been selected to provide over capacity to eliminate frequent overhauls. Brakes, 11-in. clutch, and transmission, for example, are of the size usually used on a 5-ton truck.

The Linderman brakes were chosen because of their permanent equalization, absence of self-energizing action, and longer lining life. The elimination of the self-energizing action prevents the tendency toward "axle-roll" which is responsible for the surge experienced when stopping suddenly—as often required in heavy city traffic.

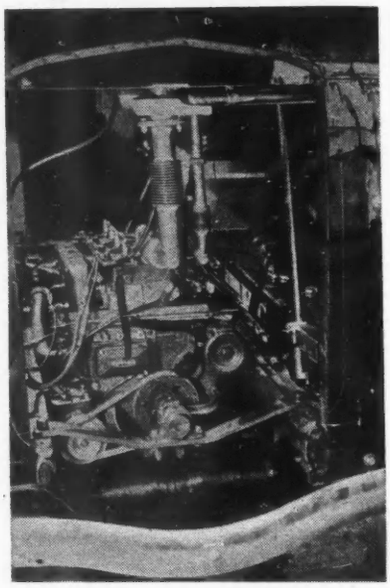
The inside height of the unit is about 6 ft., allowing drivers and shipping men to work inside the truck standing upright. A small door gives access to shelves running the full length of the body for handling rugs. Some of the units will be provided with skylights.

Unusually clear vision is provided in the design of the cab. The driver can see within 5 ft. of the front bumper without leaning forward in his seat.

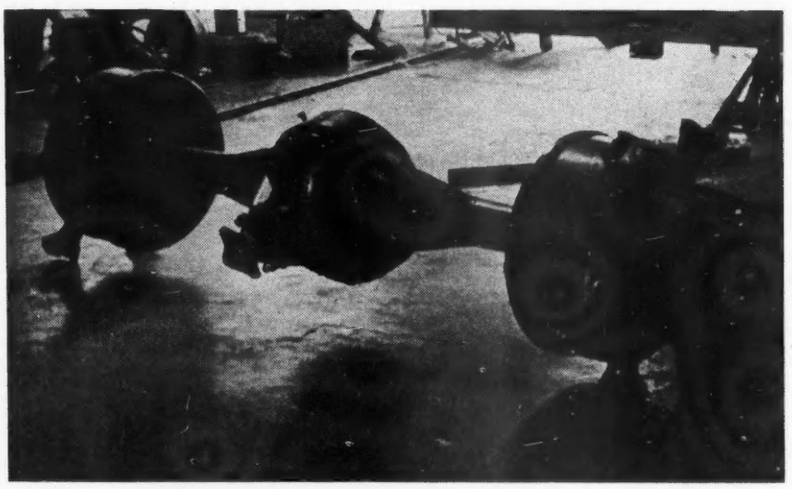
The United Parcel Service was founded in 1907 by three young men who used bicycles for delivering packages from Seattle department stores. Seven years ago the company began to serve New York department stores, and today has more than 1500 trucks in service on the coast, in Cincinnati and in New York. Last year they ran a total of about 18 million miles.

The company is wholly owned by its employees.

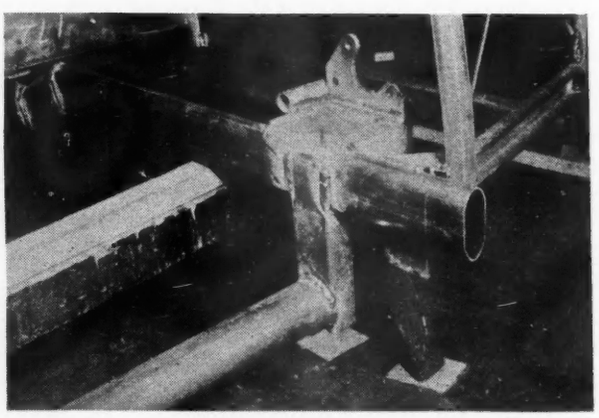
In manufacturing the trucks, the company is using the basement of the Long Island City body shop. They have two electric welders, and several gas welding outfits, beside an assortment of hand tools. Ninety per cent of the labor costs and about 12 per cent of the material costs are spent on the premises.



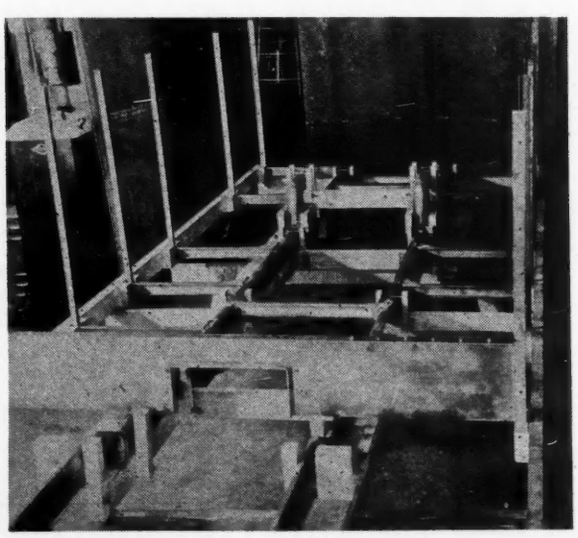
Engine, showing large steam takeoff and smaller water return from condenser.



Large size rear axle ready for assembly with spring mounting



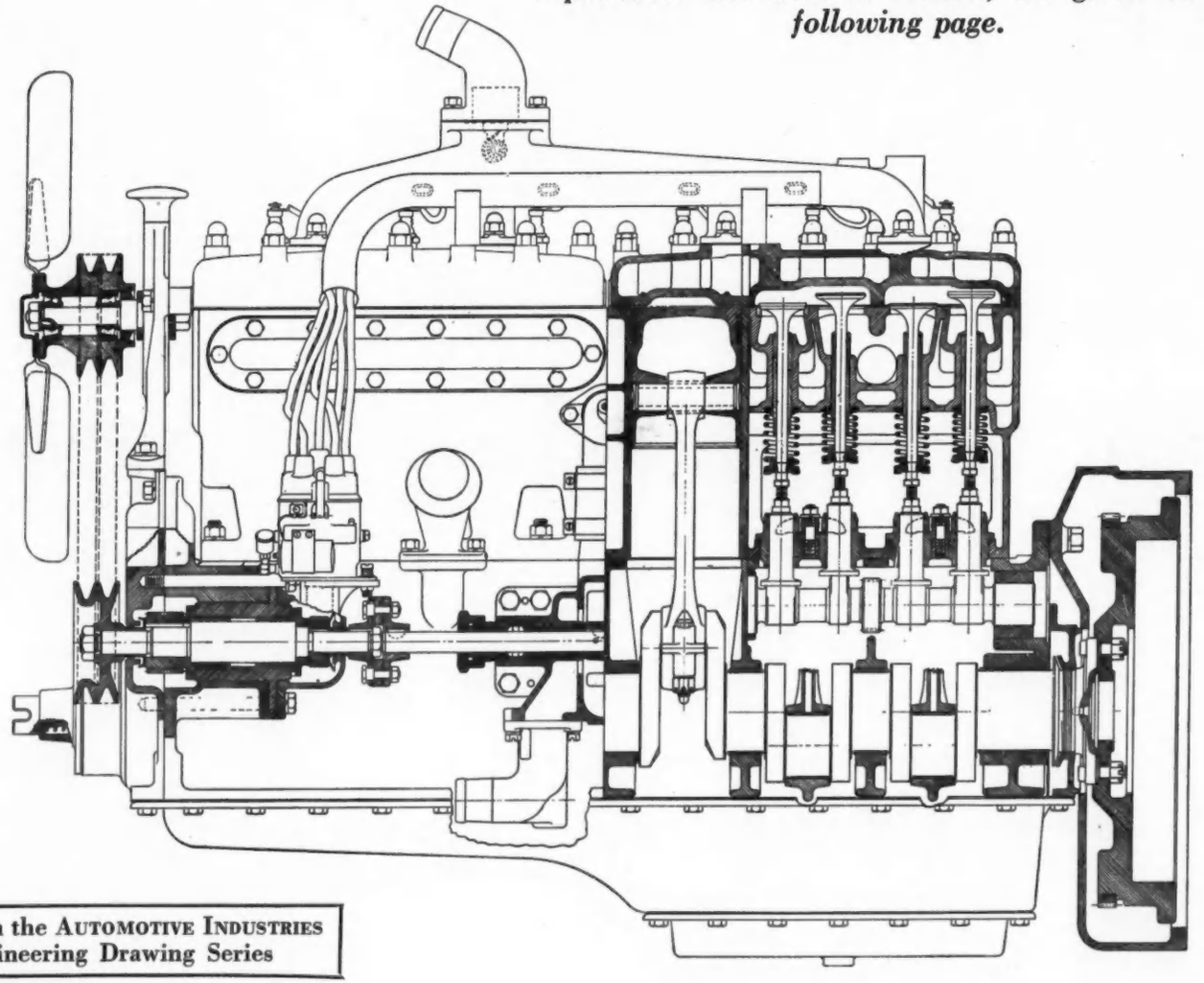
Steering gear bracket (reverse view) welded in place to the front cross member. Note that the tube has been flattened to increase vertical rigidity and to save space.



At the left the tubular frame is shown in the welding jig. Outriggers and side angle irons have been welded in place. One of the cross member tubes serves as the vacuum reservoir for the windshield wiper.

AUTOCAR . . .

six-cylinder heavy-duty gasoline engine manufactured by the Autocar Co., Ardmore, Pa. Specification data of the "Bluestreak" Model No. 501 engine, reproduced herewith in section, are given on the following page.



No. 45 in the AUTOMOTIVE INDUSTRIES Engineering Drawing Series

AUTOCAR

Bore and stroke dimensions of this six-cylinder L-head engine are 4½ in. by 5¼ in., making the total piston displacement 501 cu. in. N.A.C.C. horsepower rating is listed as 48.6. Brake horsepower developed is 123 at 2200 r.p.m.; maximum torque, 375 lb.-ft. at 800 r.p.m. Compression ratio is 5.5 to 1. Dry weight of the unit (minus fan, air cleaner and carburetor) is 1300 lb.

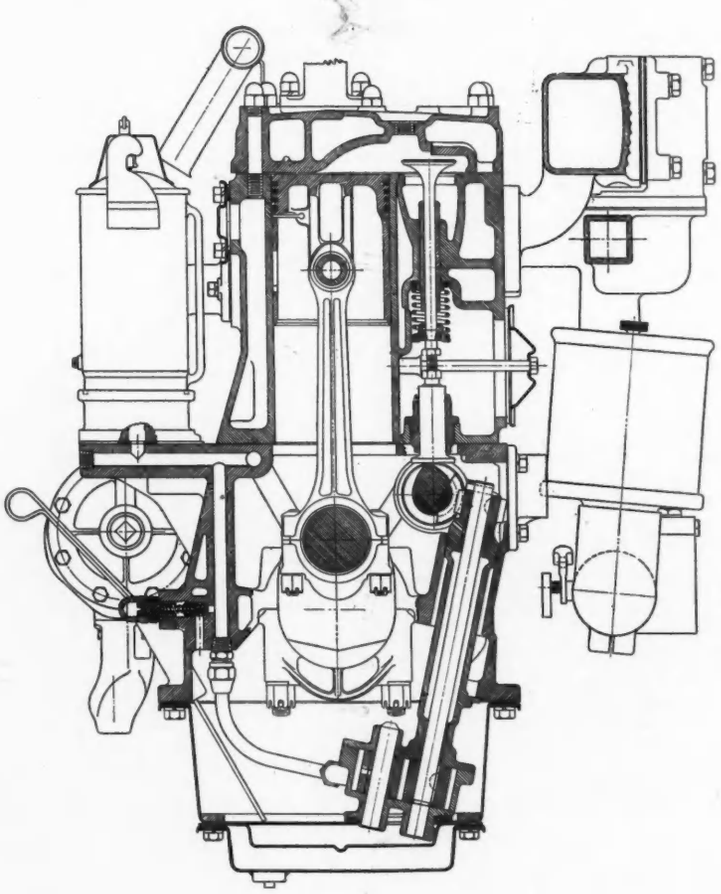
The cylinder block is made of chrome-nickel alloy iron. Exhaust valves have hardened steel seats. The crankshaft is a heat treated chrome molybdenum steel forging. Aluminum pistons are provided with four rings, three compression ⅛ in. wide and one oil-control 3/16 in. wide.

Seven main bearings support the crankshaft. All bearings are 3¼ in. diameter, total 14 13/64 in. in length and have a projected area of 46.177 sq. in. Rods are connected to pistons by floating pins retained in piston bosses by snap rings located in grooves. Connecting rods are drop forged SAE No. 2340 nickel steel, heat treated.

Valves are of poppet type with 45 deg. seats. Both valves are modified tulip form; intake is made of SAE No. 3140 chrome nickel steel and is seated in the cylinder block; exhaust is of silchrome steel and seated in inserted tool steel ring.

Lubricating oil is delivered by pump through drilled passages in the crankcase to an oil filter from which it is carried through other drilled passages in the crankcase to the main bearings of the crankshaft. It passes through drilled holes in the crankshaft to the connecting rod bearings and continues through drilled passages in the connecting rods to upper ends of the rods. Additional drilled passages from the main bearings lead to the camshaft bearings and to bearings of the timing gears in the front end of the engine.

Other elements of the "Bluestreak" engine include: Stromberg model SF-4 plain tube, up draft type carburetor; Airmaze filter type air cleaner; positive mechanical type governor with centrifugal (flyball) control, driven from timing gear train; Leece-Neville Bendix drive type starting motor; Leece-Neville generator and voltage regulator; Delco-Remy distributor; Champion 18 mm. spark plugs with gap set at 0.018-0.023 in.



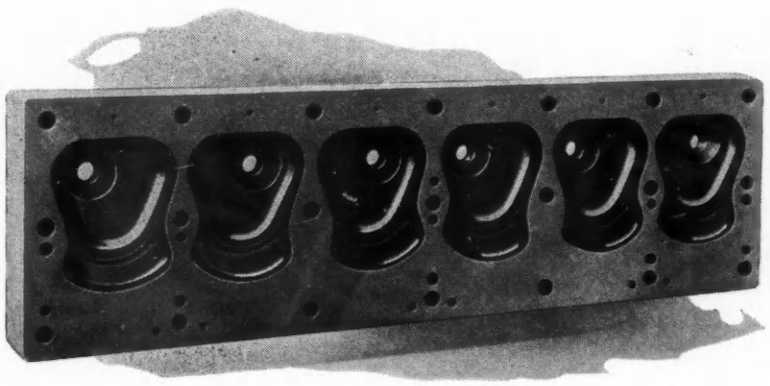
1938 Hupp—

has chrome-nickel iron-alloy engine block. Molded plastics have been generously used for decorative elements.

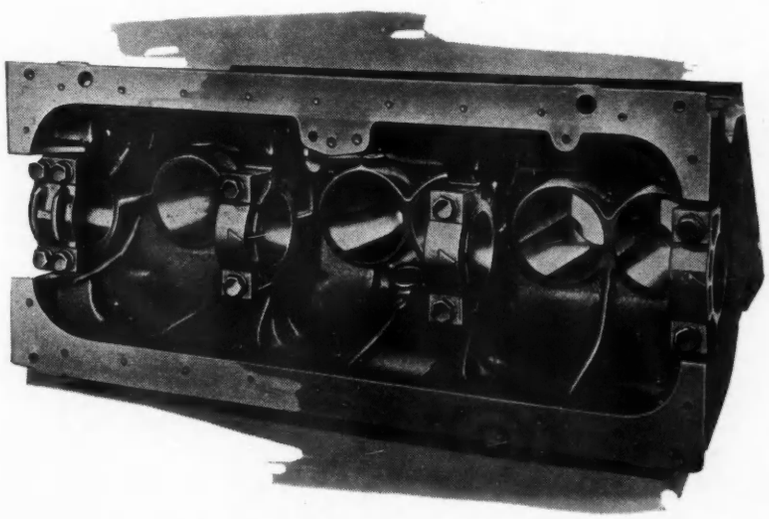
IN the design of the new Hupmobile, great care was exercised in the choice of materials. Chrome-nickel iron for the engine blocks, chilled iron for the camshafts, alloy steels and high-purity zinc for die castings are among the modern materials specified. Generous use is made of molded plastics for decorative effects in instrument-panel and hood-ornament treatment.

The engines remain substantially the same, though a number of modifications have been made in them. The Eight has L-head cylinder of 3-3/16-in. bore and 4¾-in. stroke (303.2 cu. in. displacement), and is rated 120 hp. at 3500 rpm., with a compression ratio of 5.8 to 1. It features dual carburetion and dual manifolding. The Six has L-head cylinders of 3½-in. bore and 4¼-in. stroke (245.3 cu. in. displacement); it is rated 101 hp. at 3600 rpm., with a compression ratio of 5.75 to 1. A compression ratio of 6.2 to 1 is optional.

Engine features common to both Eights and Sixes are: Cast iron heads,

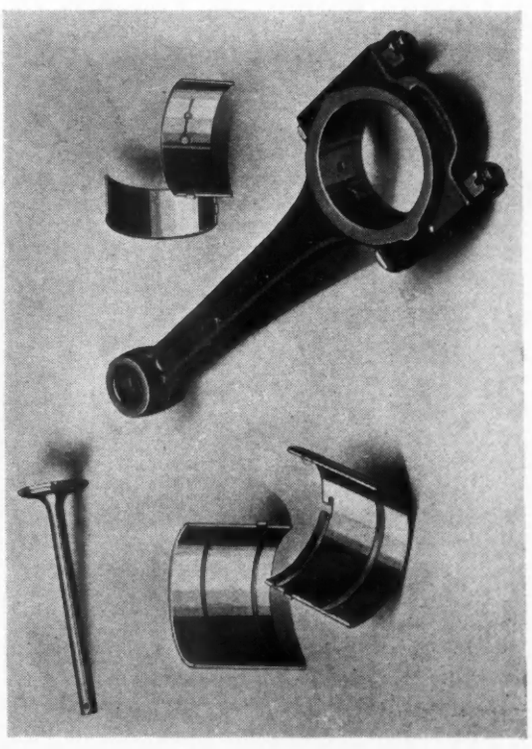


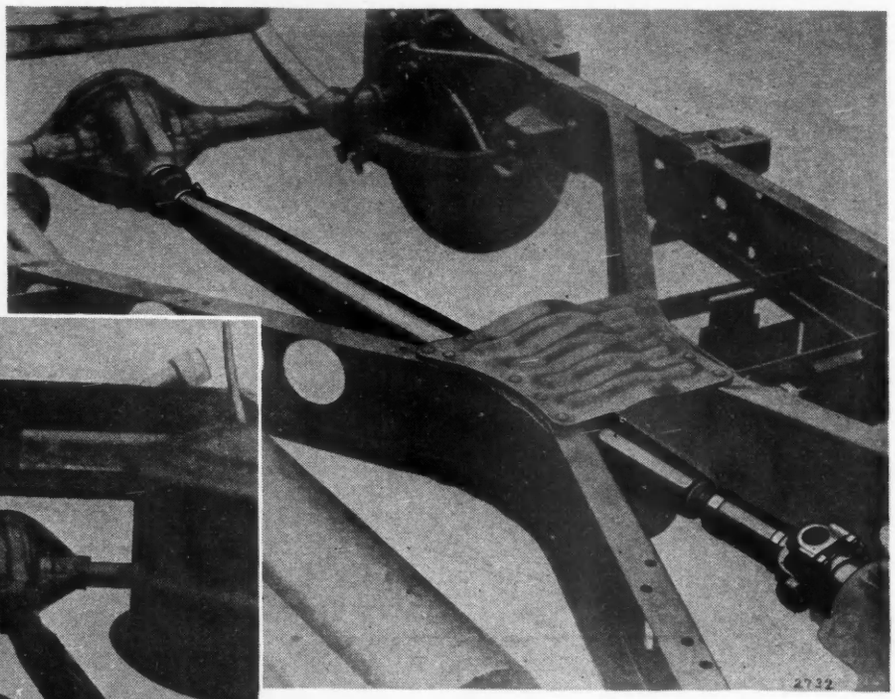
Under side of cylinder head showing form of combustion chamber



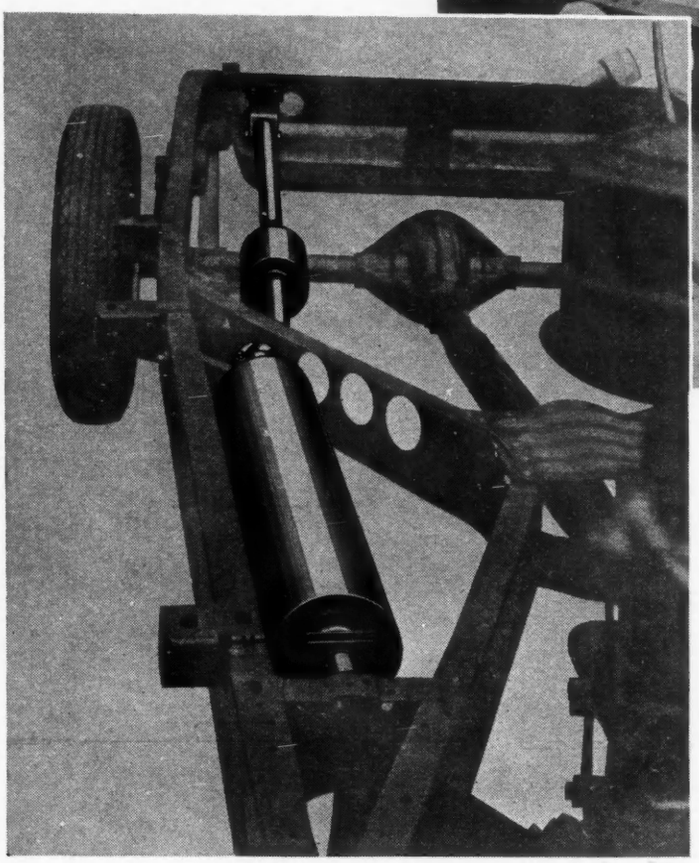
View of engine block from underneath

(Below) Connecting rod bearing shells and valve





(Below) Muffler with supplementary chamber



(Above) New tubular propeller shaft and universal joints

chrome-nickel iron alloy blocks with water jackets extending below the ring belt, counterweighted crankshafts balanced statically and dynamically, and rubber-disk vibration dampers. Main bearings are of the steel-backed, babbitt-lined precision type. There are four on the Six and five on the Eight. Rifle-drilled connecting rods are continued. Connecting rod bearings also are steel-backed babbit of the interchangeable precision type.

Camshafts are chilled alloy-iron castings with cams having low-velocity ramps. The camshaft bearings—four on the Six, six on the Eight—are of leaded bronze and removable. They are line-reamed in place. Bohnalite aluminum alloy pistons with Invar struts are standard. Both engines are fitted with four rings located above the piston pin. The top two are compression rings, with the lower edges grooved to serve as oil scrapers; the lower two are grooved-and-slotted oil control rings.

Engine lubrication is by a full-pressure system to all bearings, with oil sprays through metered holes in the

Specifications

	SIX	EIGHT
Curb Weight (4-door Sedan)	3335 lb.	3877 lb.
Overall Length	203¾ in.	206⅝ in.
Overall Height (4-door Sedan)	68 7/16 in.	68 1/16 in.
Overall Width	74 in.	74 in.
Developed horsepower	101	120
Car Speed	80 m.p.h.	85 m.p.h.
Gas Tank Capacity	16 gal.	16 gal.
Crankcase Capacity	6 qts.	8 pts.
Cooling System Capacity	18 qts.	21½ qts.
Transmission Capacity	2¼ pts.	3½ pts.
Differential Capacity	2¾ pts.	3½ pts.
Tread (front)	59⅜ in.	58¼ in.
Tread (rear)	60¼ in.	60 9/16 in.
Tire size	16 x 6.25	16 x 6.50
Superdrive Transmission Capacity	6 pts.	7 pts.

connecting rods for the cylinder walls. The crankcase capacity is six quarts on the Six and eight quarts on the Eight. Crankcase ventilation is provided for, fresh air from the fan entering the case at the front end.

"Dummy" anti-distortion heads are used when honing cylinder bores and grinding valves, so as to simulate the conditions under which the engine is assembled with heads bolted down.

The centrifugal-type water pump is mounted at the front, driven by the V fan-belt. An AC fuel pump is used, shielded with baffles arranged to scoop cooled air from the fan. Carter, triple-venturi, down-draft carburetors are standard—dual on the Eight, single on the Six—both with anti-percolating feature and fully automatic choke.

Front springs on all models have a rate of 185 lb. per in.; rear springs have a rate of 120 lb. per in. An anti-kick shackle is mounted at the rear of the left front spring. An hour-glass worm and double roller steering gear with a ratio of 16.4 to 1 is standard. Gabriel two-way hydraulic shock absorbers, thermostatically controlled, are standard on all models.

Rear axles remain the same—semi-floating type with standard ratio of 4.54 to 1 and optional ratios of 4.09 and 4.27 to 1. The Sixes continue spiral bevel gearing, while the Eights use hypoid gearing.

Pressed steel wheels 16 in. in diameter with 4½-in. rims are standard. Tires are low-pressure balloons with ribbed treads—16.25 x 6.00 on the Six, 16 x 6.50 on the Eight. Out-of-balance tolerance on wheel and tire assembly front is held to 12 in.oz.

Planned from "Carte Blanche"

(Continued from page 357)

5. One Ingersoll four-way, 8-spindle boring machine.

Valve body pads in the case are precision-faced on a single-end precision boring machine using single-point Carboloy tools.

As noted earlier, the three internal gears are finish-lapped after heat treatment, on the new Ex-Cell-O lappers. An outstanding feature of these machines is the Micro-Flex timer which controls the amount of work done on each side of the tooth. The timer controls the entire automatic cycle, running one side first, then reversing and finishing the other side. With this control the machine may be set to take any reasonable amount of stock off one side without touching the other or to take any unequal division of stock removal from each of the two sides. This makes it possible to use the machine not only for straightforward production but also as a salvage operation.

The oil pump body has been tooled up in fine fashion. The initial rough- and finish-turn operations are handled on an 8-in., 4-spindle National Acme chucking machine. A series of drilling operations are handled on a battery of two, 24-in. Cincinnati drills, each with 3-station index. Another of these machines with 5-station index is used to rough- and semi-finish the gear chambers.

The hydraulic valve body which is the very heart of the entire control system is made of an aluminum alloy die casting with intricately cored passages. Initial milling operations are handled on a group of three Kent-Owens hand mills. Then follow eight separate operations on a battery of Fosdick drills. With the exception of one operation, these are all single-spindle settings. Due to the special requirements of the hydraulic elements, the joint face of the die-casting must be provided with a lap finish so as to fit and seal perfectly on the mating ground face. Consequently, each piece is lapped by hand on a cast

Forgings with a background—

Behind every Wyman-Gordon forging stands diligent scientific examination of every bar of steel—continuous laboratory control of all processes.

WYMAN-GORDON

Worcester, Mass. Harvey, Ill. Detroit, Mich.

iron plate charged with emery.

One of the interesting items of equipment in the transmission case line is a new No. 80 Blakeslee washing machine which is used for cleaning the case after completion of machining operations. This washer is about 39 ft. long and has a normal capacity of 60 cases per hour.

It is of three-tank, pump type using an alkali solution in the cleaning tank. The first tank is the alkali wash with hot solution maintained at 180 deg. Fahr. The next two tanks are plain hot water rinses. Each tank is served by a pump, individually driven by a 7½ hp. motor, delivering about 400 gal. of solution per minute.

Work comes through the washer on a horizontal flight type conveyor with a variable speed drive. As the work goes through the various stages of washing, it is subjected to a spray from all sides so as to do a thorough job of removing dirt, oil, and chips. Spray is produced by a bank of patented directed flow nozzles installed in each of the three tanks.

Appreciating the necessity of complete removal of cutting oil from transmission gears prior to heat treating, Buick has installed a conveyorized vapor degreasing machine built by the Detroit Rex Products Company. Work is placed on the hangers spaced on 24-in. centers. In passing through the degreaser, the transmission gears are lowered into hot solvent vapors which thoroughly wet the gears and remove the oil contamination. The conveyor carries the work horizontally along the machine beneath the water jacket condenser to the opposite end of the machine, where by a traction turn it is returned to the same end of the machine from which it entered. The gears emerge clean, warm, and dry—ready for the following heat treating operations.

The machine is heated by means of steam coils which are placed in the boiling sump. These galvanized steam coils are welded to removable clean-out doors.

Rated production cleaning capacity of the machine is 2000 lb. of work per hour at a normal conveyor speed of 20 ft. per min. The overall dimensions of this unit are: Length, 28 ft. 3 in., width, 6 ft., height, 11 ft. 5⅛ in. The solvent capacity of the machine is 58 gallons.

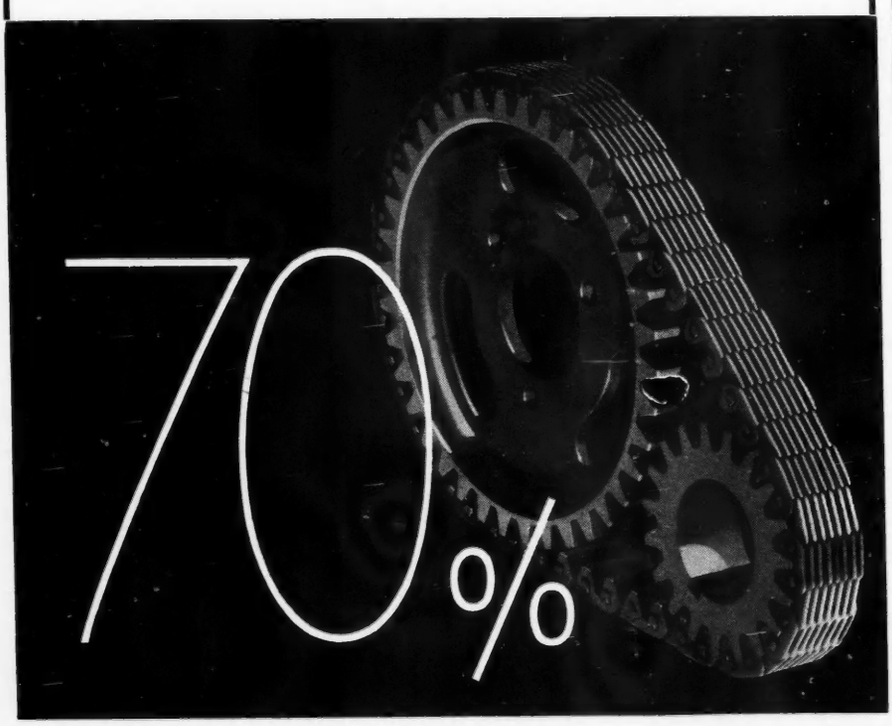
70% WERE MORSE EQUIPPED

The preference for the quietness and dependability of Morse Timing Chain performance is reflected in continually increasing demand. Again this year, a six-months' analysis shows that of all chain equipped cars made, more than 70% were Morse Chain equipped.

MORSE CHAIN COMPANY

Ithaca, N. Y. **Detroit, Mich.**

Division of Borg-Warner Corporation



TOOLS OF TOMORROW

(*Continued from page 343*)

and rearrangements of mechanical elements in redesigning as follows: cone worm drive; forced feed lubrication to all bearings; combined timing and reversing mechanism; horizontal mounting of master burnishing gears; taper roller bearings (Timken) throughout; special vee-belt drive; mechanism for rapid mounting of master burnishers; more convenient hydraulic adjustment and control; new dual push button control.

The new machine will accommodate gears within the size range of 1⅛ in. to 20-in. diameter.

Gas Indicators

. . . explosive or irrespirable gas-air mixtures detected by Linde instruments

Gas indicators developed to facilitate detection of explosive or irrespirable gas-air mixtures are offered in a new line just announced by the Linde Air Products Co., New York. The UCC gas indicators, as these instruments are named, are available in three models.

Model 12-B is intended for detection of combustible gases or vapors. A graduated meter scale indicates by direct reading whether combustible gases are present and, if they are, whether concentrations are above, within, or below explosive limits. For increasing the utility of this instrument, a flame-type safety lamp can be at-

tached which makes it possible to detect oxygen deficiencies.

Model B-1 combines three units in one. It shows the presence of combustible gases, indicates oxygen deficiency and also has a toxic chamber for determining presence of carbon monoxide and hydrogen sulfide in dangerously toxic concentrations.

Both the combustible gas indicator and the all-service gas indicator are equipped with a patented and exclusive air dilution valve. By means of this valve incoming samples can be diluted with any volume of air to make possible detection of flammable conditions which might not otherwise be indicated due to lack of oxygen. It also permits following a complete purging operation from start to purge-end point with use of inert gas as a purging medium.

Grinding

. . . 14 speed changes permit constant surface speed of abrasive wheels

For maintenance of constant surface speed of grinding wheels—despite the fact that they lose their diameter—the Charles L. Jarvis Co., Middletown, Conn., recommends its latest flexible shaft grinding unit. The manufacturer lists among the features of this machine, trade-named Vario-flex, from 12 to 14 instant speed changes without stopping the machine and complete 360 deg. swivel of the motor unit.

To illustrate the principal advantage of this equipment, the maker gives the following example: a 10-in. vitrified wheel revolving at 2200 r.p.m. has a surface speed of 5500 s.f.m. With the 14 different speeds of the Vario-flex this wheel may be worn down at a maintained peripheral speed to 4½ in., operating then at approximately 4700 r.p.m., top speed of the machine.

Straightener

. . . U. S. Tool unit power driven; handles coiled stock up to ¼ in. thick.

The U. S. Tool Co., Inc., Ampere, East Orange, N. J., has added to its line of equipment a power driven straightener for heavy coiled stock. The unit is used in conjunction with the U. S. automatic coil cradle and the U. S. slide feed and provides means of automatically removing stock from heavy coils, straightening it, and feeding accurate lengths to the punch press. The straighteners are built in a number of sizes to handle stock up to ¼ in. thick and can be furnished to accommodate any widths.

Among the features of the equipment are the following as listed by the manufacturer: all rollers equipped with needle bearings; simple automatic roll adjustment; new coil of stock may be inserted without disturbing setting of straightening rolls; single movement of operating lever releases feed rolls to start new coil; can be used in conjunction with U. S. plain stock straighteners for handling thin, springy material.

Rotary Lathe

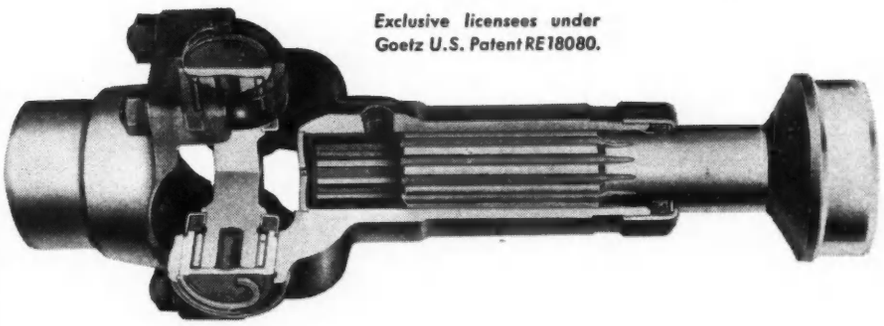
. . . eight-spindle, horizontal unit first product out of new Partool plant

An eight-spindle horizontal rotary lathe for turning flanged bodies used in automobile drive universal joints is the first product to be produced by the Partool Machine Co., in its new Detroit plant. The new building was designed and built by the Austin Co., industrial engineers and builders who have completed 14 industrial plants in the Detroit area within the past 12 months.

The lathe just introduced has a base of fabricated steel with cast iron head which is mounted on ball bearings of large diameter. Spindles can be supplied either with plain or entire friction bearings. Tool blocks are mounted on

Spicer
PASSENGER CAR NEEDLE BEARING UNIVERSAL JOINTS

Exclusive licensees under Goetz U.S. Patent RE18080.



In designing and building passenger car universal joints, there is a definite "know how" which is absolutely necessary to achieve the proper engineering, design, production and operation of propeller shafts.

That is why so many leading makes of automobiles are equipped with the Spicer Passenger Car Needle Bearing Universal Joint—a joint produced by experts who have devoted thirty-five years to specializing in propeller shaft performance.

1837 1937 TOLEDO CENTENNIAL

Spicer Manufacturing Corporation
Toledo • Ohio

BROWN-LIPE CLUTCHES and TRANSMISSIONS | SALISBURY FRONT and REAR AXLES | SPICER UNIVERSAL JOINTS | PARISH FRAMES READING, PA.

Partool eight-spindle horizontal rotary lathe for turning flanged bodies used in automobile universal joints

large diameter shafts to insure rigidity. They are cam operated.

Lubrication of the unit is fully automatic, coolant being pumped up to a reservoir on top for distribution to the work in proper quantities. The machine has a 93-in. diameter and weighs 16,000 lb., including motors which are mounted inside the base.

Pyrometer

. . . potentiometer instrument for recording and indicating thermocouple temperatures

A new potentiometer pyrometer for recording and indicating thermocouple temperatures has been developed by The Bristol Co., Waterbury, Conn. Trade-named Pyromaster, the new instrument provides for direct marking on a 12-in. round chart and scale indication on a large dial. It employs the potentiometer method of measuring electromotive force in terms of temperature, using standard thermocouples and extension leads. It operates, however, on what is said to be a new and simplified principle.

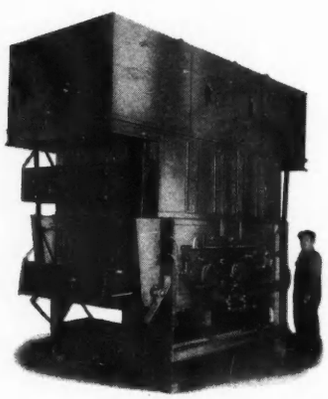
The operating mechanism consists of the following: a highly dampened sensitive galvanometer, pivoted in jewel bearings; a relay unit actuated by the galvanometer to operate the motor that balances the electromotive force from the thermocouple and positions the recording pen arm and scale indicator. Other elements of the instrument include: a standardizing unit, a power pack, and the potentiometer or recording and indicating units. The pen arm or indicator is actuated through the relay switches in small steps at a rate depending upon the rate of change in temperature at the thermocouple.

Better Metal Cleaning at Lower Costs ★ ★ ★

★ **Eliminate Rejects with Perfect Cleaning**

★ **Speed Up Your Production Cleaning**

★ **Eliminate Excessive Labor and Waste**



The Blakeslee Solvent Degreasing process renders the metal parts clean and dry in one operation. No scrubbing or soaking. Oils, greases, drawing compounds and polishing compounds thoroughly and quickly removed. All spot welds, cracks, and seams cleaned 100%.

There are small hand operated degreasers as well as the large fully and semi automatic models. No matter how large or how small your job there is a Blakeslee Dual-Vapor-Control degreaser to fit your cleaning requirements.

A 30 day free trial is offered you on any one of our standard model degreasers. The transportation charges and the solvent used during the test are the only obligations.

Literature mailed upon request

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CHICAGO, ILL.

Ignition Quality of Diesel Fuels

ACCORDING to Dr.-Ing Maxmilian Marder, writing in the Tenth Diesel Number of *Automobiltechnische Zeitschrift,* the ignition quality of Diesel fuels depends upon the decomposing tendency of the components of the fuel under the conditions of temperature and pressure existing in the combustion chamber. This tendency is inversely proportional to the energy necessary to break up the molecules. The energy of decomposition in turn is closely related to the molecular structure and the physical and analytical properties of the components. It is the same as the majority of the physical and analytical constants of hydrocarbons, increases and decreases in the same order from paraffins by way of the unsaturated hydrocarbons and the naphthenes to the aromatics. This discovery led to an investigation of the relation between ignition quality on the one hand and the physical constants and analytical data on the other. At first, however, only a quantitative relationship could be proven. It was then found that besides a physical or an analytic constant, such as the density, the hydrogen content, etc., the mean size of molecule of the fuel components, or the boiling point, which is proportional thereto, must be taken into account. This be-

comes evident when any physical constant, such as the density, is plotted against the molecular weight. Such a plot for the four classes of hydrocarbons shows that it is quite possible for hydrocarbons of different ignition quality to have the same density. For instance, a hydrocarbon of 0.76 specific gravity may be either a naphthene of 65 molecular weight, an olefine of 150 molecular weight, or a paraffin of 175 molecular weight. Only when the molecular weight (or the boiling point, which is proportional thereto) is known, is it possible to classify a hydrocarbon as belonging to a particular group of hydrocarbons. The same applies to many other physical and analytical data, as, for instance, the refraction index, the aniline point, the viscosity, the carbon content, and the calorific value. Therefore, provided the mean molecular weight or the boiling point is known, all of these constants can be made use of in the determination of the ignition quality.—ATZ.

Synthetic Resins

IN a paper on Synthetic Resins recently read before the Society of Arts, H. V. Potter described the properties of methyl ester or organic glass. This material in its initial state is a liquid, but on exposure to light, oxygen or heat it quickly polymerises to form a more stable solid compound which is water-white and glass-like in appearance. It can be cast in sheets, blocks, etc., which can be readily machined, turned and polished. It has a softening point a little above 120 deg. C. (248 deg. F.). At the same time it can be made reasonably flexible. In fact, a sheet of it looks exactly like glass until it is handled, when it is found to be much lighter, its specific gravity being only 1.15. It will bend on warming. On account of its lightness and non-brittle character it is replacing glass in airplanes. The material is fast to light, but, on the other hand, it is not so hard as glass and therefore subject to wear. Its possibilities have not yet been exploited and the materials from which it is made are rather expensive.—*The Engineer.*

Internal Grinders

. . . *primarily built for medium and large tool room work*

A precision internal grinder, primarily for medium and large tool room work, straight, bevel, two angle or straight and bevel grinding at one setting, was recently announced by Rivett Lathe & Grinder, Inc., Boston, Mass. With low speed spindle carrying a wheel up to 6 in. diameter by ½-in face it may also be used for external work.

Single bevel or single taper work is ground by swiveling the workhead or the table topslide. A feature is the swivel cross slide. By swiveling the cross slide to the desired angle and setting the grinding spindle on the center line of the machine, a straight hole may be ground using power reciprocation of the table, and then by disengagement of a latched lever on the gear box, the power reciprocation may be thrown off and an angle at the mouth of the hole may be ground concentrically without rechucking by traversing the cross slide through its handwheel. Similarly, by swiveling the table top slide, a taper hole and a bevel may be ground.

The workhead and work reciprocate with the table while the grinding wheel remains stationary. Base of the workhead is graduated to swivel 90 deg. each side of center so that the head can be set for taper grinding steeper than can be obtained by the 5 deg. swivel of the table. An individual motor drive provides three selective spindle speeds.

The grinding spindle mounts in a bracket carried on the cross slide and is driven from a 2 hp., 3500 r.p.m. motor. Two spindles are available, one for high

FORD PIONEERS WITH A MAJOR IMPROVEMENT

Develops the first *plastic water pump impeller ever used on a motor car.*

Ford engineers wanted to lick water pump inefficiency caused by corrosion, chemical reactions or impurities in the cooling system. They decided to try a new pump impeller, exhaustively tested every material they could lay their hands on . . . and finally selected Durez 77 SB. These new Durez impellers are being used on the Ford V-8 60.

Durez 77 SB combines high strength, water and chemical-resistance, heat-resistance and frictional-wear resistance. Even abrasion of the surface does not affect any of its properties, nor does it deteriorate from years of immersion in hot and freezing liquids.

Durez 77 SB is just one of the many special materials developed by General Plastics. Whether you're planning a new and unusual use for a plastic or improving on an old application, call on the largest supplier of plastics to the automotive industry. General Plastics Inc., 29 Walck Road, North Tonawanda, New York.

General Plastics'
DUREZ *Choice of the Automotive Industry*

speed and one for low speed. The cross slide on which the grinding spindle bracket mounts is carried by a swivel which is graduated to be set in any position up to 90 deg. right or left from center.

The table is mechanically reciprocated and the motion is arranged to slightly retard as the table approaches its center of stroke and to accelerate immediately when the central point is passed.

AUTOMOTIVE ABSTRACTS

(Continued from page 344)

Finally, it may be concluded from a study of the pressure records, that detonating combustion is characterized by a very rapid rise of pressure (lasting less than 0.0001 sec., which may attain and even exceed two to three times the maximum pressure of normal combustion; that this pressure is initially localized; that it occurs only toward the end of combustion; that it corresponds to the combustion of a comparatively small portion of the gaseous charge, and that it is followed by a pressure wave traversing the combustion chamber, of rapidly decreasing velocity and intensity, which is reflected several times by the chamber walls.

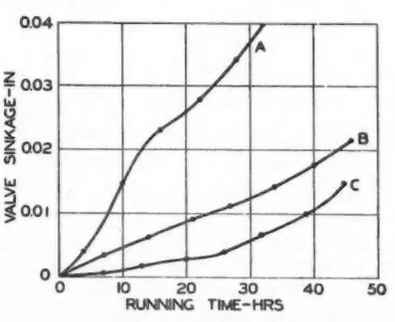
The author pointed out that the majority of those conclusions are in agreement with those reached by Rassweiler and Withrow who recorded pressure variations and flame movement simultaneously.—*Journal of the French Society of Automobile Engineers* for May.

Tests on Wear of Valve Seats

Further tests on valve-seat wear have been conducted by the Research Department of the Institution of Automobile Engineers and are dealt with in a report in the *I.A.E. Journal* (and in an article in *Engineering* by C. G. Williams, director of research of the Institution). In the earlier tests it was found difficult to obtain accurate readings of valve sinkage, owing to valve-head distortion and bad seating of the valve caused by excessive valve-guide wear. This difficulty was overcome by using a guide lined with aluminum bronze and making arrangements for lubricating it.

It appears that the oxidizing character of the exhaust gases has a strong influence on the rate of valve-seat wear. Tests were therefore made with lean mixtures, maximum power mixtures and rich mixtures, and exhaust gas analyses were taken with all of them. It was impossible to get an entirely reducing exhaust, as even with the rich mixture the exhaust had a mean oxygen content of 0.6 per cent. With the maximum-power mixture the mean oxygen content of the exhaust was 1 per cent, and with the lean mixture, 3.4 per cent. Rates of valve sinkage with the three different types of mixture are plotted in the chart herewith. With leaded fuel in the weak mixture there was a slight increase in sinkage, but this was within the experimental error. With a valve clearance (or tappet clearance) of 0.020 in. the rate of sinkage was about eight times as great as with a clearance of 0.006 in.

Comparative tests were carried out on about thirty different insert materials in conjunction with exhaust valves of austenitic steel, a new valve being used for each seat material. In addition, a stellited insert was tested against a stellited valve. The tests were carried out at a temperature of 1320 deg. F. in an oxidizing atmosphere using a tappet clearance of 0.020 in., experience having shown that these conditions induce a fairly rapid rate of wear. As a result of the tests the various insert materials were rated in the following order: High-speed steel (heat-treated), stellited insert (stellited valve), Monel metal, K Monel metal, Stellited insert, cast iron C (Cr.-Mo.), nickel-beryllium alloy, beryllium bronze, high-speed steel (normal), chromium plate, high-chromium cast iron, nickel-manganese-chromium steel, cast iron H (heat treated), aluminum bronze (forged), austenitic cast iron, cast iron B, copper-zinc alloy, copper-zinc-tin alloy, cast iron D (heat treated), copper-nickel alloy, cast iron E, aluminum bronze (cast), mild steel, cast iron D, cast iron F (chromium-aluminum), cast iron H, cast iron A, cast iron G (26-per cent nickel), aluminum alloy.—*I. A. E. Journal.*



Effect of mixture-strength on valve-seat wear. Mixture ratios: A, 17.2; B, 13.4; C, 11.8.

1937 ACHIEVEMENT ISSUE OF AUTOMOTIVE INDUSTRIES, October 23, will be published at the close of the National Metals Congress in Atlantic City and on the eve of the opening of the New York Automobile Show. Its editorial pages will comprise a REVIEW of the 1937 production year just ending and a PREVIEW of the 1938 production year just beginning. Its advertising pages will constitute a ROLL CALL OF AUTOMOTIVE LEADERS. The volume of advance space reservations indicates that it will be the largest issue of its kind in seven years.

Auto-Union Racing Car

(Continued from page 336)

the chassis as a whole, thereby placing them relatively low, it is sought to prevent slewing or turning of the car around a vertical axis through the center of gravity regardless of variations in the adhesive forces between tires and road due to inertia effects. Such an arrangement of the components, of course, greatly reduces the moment of inertia of the car around the vertical axis through the center of gravity.

In the motor vehicle described in the patent specification, the engine crankshaft is placed at a lower level than the wheel axis, the engine being located ahead of the rear axle. The drive shaft is extended through the final drive housing to the transmission back of the axle. The fuel tank is located approximately at the center of the chassis, ahead of the engine, which has the advantage that the reduction in its weight due to the consumption of the fuel has practically no effect on the weight distribution between front and rear wheels. The position of the engine ahead of the rear axle makes possible the adoption of the familiar block construction with engine, transmission and final drive gear arranged in a single unit.

One of the photographs reproduced here shows the front wheel with its brake and suspension system. The racer has the Porsche torsion-bar suspension, of which an illustrated description appeared in AUTOMOTIVE INDUSTRIES some time ago. The provisions made for intensive cooling of the front brakes are of interest. In addition to ribs or fins on the brake drum there is an air scoop on the brake backing plate admitting air to the interior, the air thus admitted escaping through louvers in the backing plate on the rear side.

With the torsion bar independent suspension system there is, of course, no front axle. Its place is taken by a transverse tube of fairly large diameter which forms part of the tubular frame. A good idea of the frame design can be obtained from the center left picture in the group, which also shows the central mounting of the steering column.

The lower left picture shows a general rear view of the racer, while the two remaining photos are devoted to the powerplant, the upper one showing a three-quarter rear view and the lower one a three-quarter front view. In the latter the supercharger with its finned housing is clearly visible. It will be noted that the transmission housing also is provided with numerous fins.

Illustrations and the information given above were supplied by the Hansea Corporation, New York, which reprents Dr. Porsche in this country.

Sets New Power Boat Marks

Sir Malcolm Campbell averaged 129.5 m.p.h. on Lake Maggiore, Locarno, Switzerland, in test runs Sept. 2 with his "Bluebird" racing boat. The speed mark was set up on the second day of the trials. He had set new marks with his first efforts. The old record time for power boats was 124.86 m.p.h., made by Gar Wood with Miss America X in 1932. "Bluebird" is powered by a single Rolls Royce airplane engine of 12 cylinders. It is the same engine which was used in his record-breaking "Bluebird" racing automobile.

Sir Malcolm's boat, designed by Fred Cooper, is one of the lightest unlimited class hydroplanes ever built.

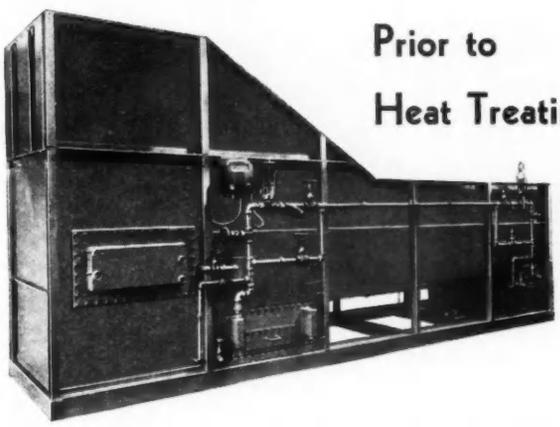
Goodyear Aids Quezon

Development of the Philippines into an important source of supply for the world's raw rubber market is indicated as a result of announcement that President Quezon of the Philippine Republic has been promised the cooperation of the Goodyear Tire and Rubber Company in the development of rubber plantations in the Islands.

President Quezon, on a recent visit to New York, conferred with P. W. Litchfield, Goodyear president, concerning his company's experience in rubber raising in the Far East which includes a 2500-acre plantation in the Philippines. Mr. Litchfield agreed to give the Philippine government the benefit of his company's experience in developing rubber plantations in the Philippines.

ANOTHER EXAMPLE OF DETREX

Cleaning Achievement . . .



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The cleaning job being done in a plant of one of the foremost automobile manufacturers with the large, completely automatic Degreaser illustrated is typical of Detrex installations everywhere.

OPERATION:
Removing cutting oils from clutch plates and gears prior to heat treating.

PRODUCTION:
2,000 lbs. of work per hour; 16,000 lbs. per 8-hr. day; 80,000 lbs. per 5-day week.

RESULTS:
Maximum cleaning efficiency—less handling expense and faster cleaning time. Work emerges clean, warm, dry—ready for following heat treating operations. Muss, fuss, scrubbing and extra drying operations are completely eliminated.

In many other heat treating departments, Detrex installations are setting new cleaning standards. In the complete line of Detrex Degreasers—ranging from small hand-operated units to large, automatic, conveyorized machines—you will find the machine to give you an equally good cleaning record.

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